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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Chemical Information Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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80-2401. Streibig, J. C. (Dep. Crop Husb. & Plant Breed., Agric. Univ., DK-2630 Taastrup, Denmark) **Models for curve-fitting herbicide dose response data.** *Acta Agric. Scand.* 30(1): 59-64; 1980 (23 references).

Oat seedlings exposed to simazine were grown, and growth rates as a function of pesticide concentration were determined. The commonly used logit transformation and non-linear regression analysis were shown to be inadequate to describe the dose response curves generated during the experiments. A modified log-logistic equation was fitted to the bioassay data and the goodness of fit was assessed in relation to an analysis of variance. This model is shown to estimate the potency of a herbicide and its standard error.

80-2402. Virtanen, M. T.; Roos, A.; Arstila, A. U.; Huttula, M. L. (Dep. Biol., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **An evaluation of a model ecosystem with DDT.** *Arch. Environ. Contam. Toxicol.* 9(4): 491-504; 1980 (23 references).

The reproducibility, variability, and reliability of a simple aquatic-terrestrial model ecosystem experiment was tested with *p,p'*-DDT. The variation among the model replicates as well as within the units was studied by using hierarchal analysis of variance. The complete budget of the chemical was calculated and a theoretical transport model was constructed. The degradation and accumulation of DDT was followed by gas chromatographic residue analysis, which showed good reproducibility of the experimental design. The degradation of DDT in the model was similar to that found in the field, but the determination of concentration factors was questionable. The material balance tables revealed that the soil and bottom substrates were the main contributors, which regulated the fate of the chemical in the model. The usefulness of the model is presented in this report. (Author abstract by permission)

80-2403. Brown, M. (Author address not given) **Drums of death.** *Audobon* 82(4): 120-133; 1980.

Several cases are cited wherein dangerous chemicals, including agricultural chemicals, have been improperly stored or discarded and have subsequently caused severe environmental damage. Near White Lake, Michigan, two billion gallons of groundwater were tainted by industrial compounds including hexachlorocyclopentadiene, a pesticidal intermediate more persistent and toxic than DDT. Fish caught in Indian Creek, Alabama, were so loaded with DDT that the chemical was detected in blood samples from fishermen in Triana. Trichlorophenol wastes were found in the soft pine regions of South Carolina, on median strips on Michigan highways, in landfills between canyon walls in California, in empty homes in Louisiana, and on empty lots in the Bronx to Washington state. In Meldon, Tennessee, insecticide wastes including aldrin, seeped into well water causing paralysis, nausea, liver disorders and severe headaches. At West Point, Kentucky, pulmonary edema, respiratory distress, nausea, memory loss, eye irritations, and abnormal liver and kidney functions resulted from exposure to hexachlorocyclopentadiene. Love Canal, New York, was declared a national emergency area. Pastureland near Darrow and Geismar, Louisiana, was contaminated with hexachlorobenzene. The difficulties involved in properly disposing of and storing these toxic wastes are briefly discussed. The apparent lack of controls and entry of unqualified persons into this field of activity seem to be two major obstacles to achieving safety in this area of environmental concern.

80-2404. Walton, S. (Author address not given) **Biocontrol agents prey on pests and pathogens.** *BioScience* 30(7): 445-447; 1980.

An overview of the control of pests and plant pathogens by biological means is presented. Advantages of biological control agents as opposed to chemical agents in pest management programs are listed. The main drawbacks in using biological controls are the difficulty involved in commercial preparation and marketing of these agents and the need for more careful planning on the part of farmers. At a recent symposium on biological pest control in crop production held at the USDA Agricultural Research Center in Beltsville, MD, the commercial interests in biological control agents were highly represented. Success in controlling certain plant diseases has been reported by plant pathologists. However, biological control of plant pathogens is not always as reliable as chemical methods and is subject to variability in effectiveness due to weather conditions and subtle changes in the plant-pathogen balance. Chemical control of insect pests has resulted, in many instances, in the build up of resistance by the pest to the insecticide. Insect control by other insects, and by fungi, protozoa, bacteria and viruses, are considered. The control of weeds by species-specific insects is discussed. The regulation of research and use of biological pest control agents by the US EPA is mentioned. The economics of biocontrol in pest management are also examined.

80-2405. Pardo, A. D.; Schiff, J. A. (Inst. Photobiol. Cells & Organelles, Brandeis Univ., Waltham, MA) **Plastid and seedling development in SAN-9789 (4-chloro-5-(methylamine) 2-(α,α,α-trifluoro- *m*-tolyl) 3-(2*H*) 3-(2*H*)-pyridasinone) treated etiolated bean seedlings.** *Can. J. Bot.* 58(1): 25-35; 1980 (44 references).

Studies were performed on the effects of the pesticide SAN-9789 (norflurazon) on etiolated bean seedlings. Seeds of *Phaseolus vulgaris* were germinated in total darkness at 26°C in vermiculite. Nutrients were added when seeds were watered. The pesticide was added on the first 2 days only. Growth was measured after 5 and 15 days. The effects of red light were determined by exposing the seedlings on day 5. Pigments were extracted and analyzed by thin layer chromatography. Leaves were examined by electron microscopy and histological examinations of the hypocotyl were performed by light microscopy. The

pesticide was found to inhibit carotenoid synthesis at the phytoene level. In the primary leaves, however, prolamellar bodies and thylakoid membranes containing phototransformable protochlorophyll(ide) were formed. The pesticide caused developmental effects similar to red light. However, red light did not reverse the effect of the pesticide, and the effect is concluded to be not directly on the phytochrome. In contrast to primary leaves, the first trifoliate leaf of treated plants contained very little carotenoids (0.2% of control). There was, however, normal development of etioplasts, prolamellar bodies, thylakoid membranes and phototransformable protochlorophyll(ide). A discussion of possible mechanisms of action of this pesticide is presented.

80-2406. Swanson, E. B.; Tomes, D. T. (Dep. Crop Sci., Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Plant regeneration from cell cultures of *Lotus corniculatus* and the selection and characterization of 2,4-D tolerant cell lines.** *Can. J. Bot.* 58(10): 1205-1209; 1980 (13 references).

A rapidly growing, friable, green 2,4-D tolerant callus line of birdsfoot trefoil (*Lotus corniculatus* cv. Leo) was isolated and characterized. Selected and control callus stocks were compared for cell morphology, growth rate, totipotency, and 2,4-D tolerance. Regeneration of plants was carried out from both the 2,4-D tolerant callus and from a number of callus lines which had been exposed to high 2,4-D levels. Shoot tip culture is being used to maintain and increase the selected plant populations. The tolerant cell line is required for experimental purposes to demonstrate correlations between *in vivo* and *in vitro* studies.

80-2407. Smirnoff, W. A. (Laurentian For. Res. Cent., Canadian For. Serv., Dep. Environ., Sainte-Foy, Quebec G1V 4C7, Canada) **Results of spraying *Bacillus thuringiensis* 2 consecutive years over balsam fir stands damaged by spruce budworm.** *Can. J. For. Res.* 9(4): 509-513; 1979 (8 references).

In 1977-1978, 7 40-ha blocks composed primarily of balsam fir (*Abies balsames*) were used in studies designed to test the effectiveness of spraying *Bacillus thuringiensis* for control of spruce budworm. The trees had undergone 1 yr of moderate and 3 yr of severe defoliation by the budworm. Larval populations before and after treatment were determined by the number of insects of a 45 cm branch tip sampled in the midcrown of each marked tree. Combinations of formulations of 3 *Bacillus* concentrates from different producers and 2 carriers (sorbitol and sodium dihydrogen phosphate) were tested. A Grumman Ag-Cat aircraft equipped with a boom and nozzle spray system was used. It was determined that an adequate and homogenous dispersion of the *B. thuringiensis* formulations was achieved by proper calibration of the boom and nozzle spray system. Final larval mortality exceeded 80% in the majority of the treatments. In treated blocks, current-year growth defoliation ranged from 35.5 to 99.5% and from 7.4 to 47.1% in 1977 and 1978, respectively. In untreated blocks, it ranged from 94.8 to 100% and from 81.8 to 100% in 1977 and 1978, respectively. It was determined that in 1978 in treated blocks, much of the current-year growth was preserved and 100% foliage potential was re-established.

80-2408. Dagani, R. (Author address not given) **Aquatic toxicology matures, gains importance.** *Chem. Eng. News* 58(216): 18-23; 1980.

The field of aquatic toxicology has as its major concern the protection of various aquatic organisms and ecological communities from the sometimes disasterous effects of man-made chemicals. Legislation passed in recent years in an effort to gain control over this area of concern is briefly reviewed. Differences between mammalian toxicology and aquatic toxicology are outlined. Experimental efforts used in the field of aquatic toxicology testing are discussed, and various species used in these tests are listed. The metabolism of foreign compounds by aquatic species has not been investigated to a great extent, but some research is now being done. Analogous detoxification systems have been found in mammals and the aquatic world. Aquatic scientists are also using biochemical techniques to measure changes in cytochromes P-450 and sodium-potassium-activated ATPase activity. Histological tests are also considered.

80-2409. Wearing, C. H. (Entomol. Div., D.S.I.R., Auckland, New Zealand) **Integration of biological and chemical control.** *Chem. N. Z.* 44(2): 51-53; 1980 (10 references).

An overview of pesticide use is presented. It is suggested that in the future pesticides will be used increasingly within integrated control or pest management programs. Disadvantages of a purely chemical approach to pest control include resistance, pest resurgence due to destruction of natural enemies and diseases, secondary pests rising to prominence, toxic hazards, and increasing costs. It is noted that chemicals are still the most powerful tool for pest population management, but exclusion of other available methods has led to abuse, excessive use, and waste of chemicals. Under integrated control programs, the ecology of the pest must be fully understood, natural control must be allowed to work as much as possible before human intervention, and artificial controls should be applied only when the economic threshold is reached. Some of the control options available for integrated control programs are mentioned, along with techniques for obtaining ecological selectivity with broad-spectrum pesticides. Some examples of successful integrated control are cited, including control of cotton and citrus crops in the San Joaquin Valley of California, where integrated control was cheaper, less risky, and reduced pesticide usage by about 50%.

80-2410. Mahoney, M. P. (Author address not given) **The great pesticide paradox.** *Citrus Veg.* 43(7): 55, 57, 58; 1980.

A commentary is presented in which it is stated that the banning of some pesticides has not been necessary, but has been dangerous. It is argued that the banning of chemical pesticides has caused the resurgence of a number diseases, including malaria, which returned following the banning of DDT. DDT was banned partially due to its persistence in the environment. The advantages of persistent compounds, including lower frequency of application and less chance of immediate harm to nontarget plant and animal species in the area, are discussed. It is suggested that similarity between PCB and DDT may have resulted in mislabeling of samples, which may have given an inaccurate estimation of DDT contamination. Toxicity and cancer data are questioned due to the fact that many innocuous substances causes cancer when administered to laboratory animals in large doses. It is noted that, except for lung cancer, all forms of cancer are static or declining in the United States, even during periods when many new agricultural chemicals were being introduced.

80-2411. Anonymous **The war against the insects.** *Consum. Res. Mag.* 63(7): 9-14; 1980.

The difficulties of controlling insect pests in and around the home are discussed. In recent years many of the chemicals which had been used have come under tighter control by the EPA and FDA. However, many of the chemicals marketed today have higher toxicities toward humans than the chemicals they are replacing. The consumer is cautioned to read the label carefully, know what chemical is being used, understand the range of applications and follow instructions provided for usage, storage and disposal of the container. Some chemicals have a long persistence in the environment and have been banned. The application of less persistent chemicals must be made more often, exposing the homeowner to more frequent doses of chemicals than in the past. A safety code for proper and safe use of pesticides is included. Pesticides suggested for use to control vegetable and flower pests are presented in tabular form. Restrictions governing the use of 39 pesticides and the enaction dates of the restrictions are listed. The estimated relative acute toxic hazards to spraymen of 82 pesticides are also given.

80-2412. Contreras-Galvez, S. E. (Univ. Florida, Gainesville, FL) **Seasonal abundance of pest and beneficial arthropods in response to management strategies in corn.** *Diss. Abstr. Int. B* 40(8): 3568; 1980.

The seasonal abundance of certain harmful and beneficial arthropods and nematodes and their response to four pest management strategies were studied in relation to two different planting dates in field corn, in Alachua County, Fl, during 1977-78. The data suggest that the abundance of species was influenced by weather factors, planting dates, and/or pest management strategies. Adverse climate and late planting together resulted in a severe pest situation. Nematode populations were probably affected by the drought; however, planting date and pest management strategies had no measurable effect on nematodes. Some species of ground arthropods were affected by the drought and planting date but not by the pest management strategies. The carabid fauna was probably affected by the drought. In general, relatively low numbers of carabids were collected in field corn, regardless of planting date or management strategy. *Conoderus* spp. and the dermapteran, *Labidura riparia* (Pallus) were favored by late planting and rainfall. Yield data from field corn grown under different pest management strategies suggested that the elimination of any needed protective pesticide resulted in higher population of certain pests and a corresponding reduction in yield. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8002843).

80-2413. Diner, A. M. (Auburn Univ., Auburn, AL) **Mode of action of a new amide herbicide metolachlor.** *Diss. Abstr. Int. B* 40(12): 5487; 1980.

Absorption and translocation of root and foliar-applied ^{14}C-labeled metolachlor were determined in grain sorghum *[Sorghum bicolor* (L.) Moench], corn *(Zea mays* L.), soybean *[Glycine max* (L.) Merr.], and cotton *(Gossypium hirsutum* L.). Root-applied herbicide was absorbed and radiolabel was translocated through plants of each species by 3 hr. Foliar application of ^{14}C-metolachlor to grain sorghum and corn resulted in rapid (within 3 hr) translocation of the radiolabel to tips of the treated leaves. No basipetal translocation of label occurred from the leaf tips or site of herbicide application. In soybean and cotton, no movement of radiolabel was observed from the site of foliar application of the herbicide. The effects of metolachlor and alachlor on both α-amylase synthesis in barley seed and lipid synthesis in cotton root tips were determined. Inhibition of synthesis of α-amylase was observed only by alachlor or metolachlor concentrations in excess of 10^{-3} *M*. Synthesis of phosphatidyl choline in cotton root tips was inhibited by both alachlor (23%) and metolachlor (89%), using ^{14}C-choline as precursor. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8012711)

80-2414. Wheeler, R. P. (Author address not given) **Pollution from farms.** *Effluent & Water Treat. J.* 20(2): 61-65; 1980 (2 references).

River and stream pollution in Great Britain is discussed. Few cases of point pollution have occurred even though farm waste pollution is a potentially serious environmental threat. An incidence of commercial tomato kill from use of herbicide-contaminated imported water is cited. Two fires, which discharged pesticides into drainage systems, resulted in heavy fish kill as well as the temporary

shutdown of public water supply intake valves. The British agrochemical society is reported to be involved in designing larger storage and transport facilities at both the wholesale and retail level. Consideration is also given to other types of farm waste effluent and treatment of farm waste pollution.

80-2415. Bischoff, K. B. (Dep. Chem. Eng., Univ. Delaware, Newark, DE 19711) **Current applications of physiological pharmacokinetics.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(7): 2456-2459; 1980 (20 references).

Physiological pharmacokinetic modeling uses available physiological and physiochemical information as well as pharmacological data to predict the consequences of exposure to various foreign chemicals. Attempts to use this method for environmental toxicants such as dieldrin, Kepone (chlordecone) and PCBs are discussed. Studies currently underway at both the whole body and neuron levels are outlined briefly.

80-2416. Hartmann, W.; Schroeder, H. (Sekt. Biol. Chem., Paedagog. Hochsch. Guestrow, DDR-26 Guestrow, DDR) **Wirkung von Chlorpropham auf ide Bluehinduktion von Winterraps (*Brassica napus* var. *oleifera* L.), Sorte Luesewitzer Spatsaatvertraglicher. [Effect of chlorpropham on the flower induction of winter rape (*Brassica napus* var. *oleifers* L.), cultivar Lusewitzer-Spatsaatvertraglicher.** *Flora* 168(6): 529-539; 1979 (21 references) (German).

Studies of the effects of chlorpropham on flower induction of winter rape are presented. Light micrographs demonstrated the inhibition of rib meristem development and the prolongation of meristem stages. Mitosis was also affected. Plants treated in August remained as rosettes for one season, but formed shoots, flowers and fruits the following season. Vernalization was not prevented. The pesticide inhibited development up to February, but no effect on growth occurred later in the year.

80-2417. Metzner, H. (Inst. Chem. Pflanzenphysiol., Univ. Tuebingen, Tuebingen, BRD) **Nutzen und Schaden von Pflanzenschutz. [Benefits and harm from pesticides.]** *Fortschr. Med.* (20): 757-758, 787; 1980 (German).

The introduction of chemical pest and weed control in the world involving > 100 different active agents has eliminated hand weeding in agriculture. On a world-wide basis harvest yields were raised 25-45%, depending on the type of crop. The general introduction of DDT has resulted in the almost complete elimination of malaria by controlling *Anopheles* mosquitos. On the debit side are the steadily increasing costs of raising crops, contamination of the environment, and the accumulation of harmful chemicals in the food chain through deposition in plant and animal lipids. For example, plankton generally contains 0.04 ppm DDT. However, the cost-benefit balance is sometimes difficult to assess. Termination of DDT spraying in Ceylon has raised the incidence of malaria from nearly zero to > 10,000 cases annually. The introduction of biological pest control methods is suggested.

80-2418. Yein, B. R.; Singh, H.; Goswami, K. P. (Punjab Agric. Univ., Ludhiana, Punjab 141004, India) **Combined influence of pesticides and fertilizers on the nodulation and development of greengram.** *Indian J. Agric. Sci.* 49(12): 961-966; 1979 (15 references).

Field experiments were carried out to determine the combined influence of pesticides, nitrogen and phosphorous on the nodulation of greengram (*Vigna radiate*). The pesticides tested were aldicarb, endosulfan and captan. They were applied alone, and in various combinations with each other and with nitrogen and phosphorous. Except for endosulfan and captan, the chemicals were applied in the soil furrows before seeding the crop. Captan was used as a seed dresser. Endosulfan was sprayed twice, 4 and 8 wk after sowing. The dry weights of plants and of nodules were determined 4 and 8 wk after sowing. Aldicarb alone or in combination with nitrogen and phosphorous increased the dry weight of both nodules and plants. Captan masked the effects of aldicarb. Endosulfan had little effect. Phosphorous increased nodulation, but nitrogen did not. The dry weight of nodules, but not of plants, was increased by the combined application of nitrogen and phosphorous.

80-2419. Chakraborti, S.; Das, K. K.; Banerjee, S. K. (Dep. Biochem., Univ. Coll. Sci., Calcutta 700019, India) **Malathion exposed seeds of *Vigna sinensis* change in the activity of plasma membrane bound monovalent ion stimulated ATPase.** *Int. J. Environ. Stud.* 14(3): 217-221; 1979 (16 references).

Seeds of *Vigna sinensis* were allowed to germinate for 72 hr in experimental plates containing 400 ppm malathion to determine the effect of the pesticide on the activity of plasma membrane bound ATPase. At the end of the exposure period, the roots were excised, ground, and centrifuged to isolate the plasma membrane. ATPase activity was then assessed. It was determined that divalent activating cation Mg^{2+} is required for the stimulation of plasma membrane bound ATPase, and that monovalent cations like Na^+,K^+ provide further stimulation. Results support the concept that cation-activated ATPase is associated with the membrane transport of the root cells of the seed. Malathion at 400 ppm stimulated the activity of this enzyme. The stimulation was non-competitive in nature.

80-2420. Anonymous **Meeting announcement.** *Int. Symp. Crop Prot.* 1980.

The thirty-third International Symposium on Crop Protection will be held at the Faculty of Agricultural Sciences of the State University of Gent in Belgium on 5 May 1981. English summaries of all papers will be available. The proceedings will be published in a future issue of *Meded. Fac. Landbouwwet. Rijksuniv. Gent.* For further information please send all correspondence to The Secretary, Faculteit van de Landbouwwetenschappen, Coupure Links 533, B-9000 Gent, Belgium.

80-2421. Vizcaino, G. (Inst. Invest. Clin., Maracaibo 4001-A, Venezuela) **Insecticidas y trastornos hematopoyeticos. [Insecticides and bone marrow failure.]** *Invest. Clin.* 21(1): 1-2; 1980 (Spanish).

The general problem of hematopoietic disorders caused by insecticides is discussed in this editorial, with special reference to developing countries. Thrombocytopenia and bone marrow hypoplasia are seen frequently in Third World countries, especially among children, due to residual effects of insecticides. Many of these insecticides have already been banned in industrialized countries specifically because of their adverse hematological effects. The mechanism of action of such insecticides is not known. There is a relationship between the intensity and frequency of exposure and the myelosuppressive effect. Individual susceptibility plays a major role as well.

80-2422. Lindquist, R. K.; Simonet, D. E.; Krueger, H. R. (Dep. Entomol., Ohio Agric. Res. & Dev. Cent., Wooster, OH 44691) **Comparison of permethrin applied as a foliar spray and root soak for cabbage looper control on greenhouse chrysanthemum cuttings and celery transplants.** *J. Econ. Entomol.* 73(3): 381-384; 1980 (1 reference).

A method of soaking chrysanthemum cuttings and celery transplants in permethrin solutions was evaluated to determine efficacy and foliar residues. Plants were soaked in solutions containing 625-2500 ppm permethrin ± a surfactant, Hyamine 3500. This method was compared with a standard foliar application of the same permethrin concentrations + the surfactant. Root soaking in permethrin + surfactant resulted in higher residues but also caused moderate-severe phytotoxicity. No significant growth reduction occurred in permethrin-only root soak or any foliar spray treatments. Root soak treatments of permethrin were efficaceous *vs. Trichoplusia ni* (Huebner) on chrysanthemum but not significantly ($P = 0.05$) better than foliar sprays. *T. ni* mortality was quite variable on celery transplants soaked in permethrin solutions, probably due to the root system being surrounded by soil. Because of the excessive rates necessary to provide adequate *T. ni* control in root soak treatments, we conclude that the method is not practical for use on a commercial scale. (Author abstract by permission)

80-2423. McLaughlin, J. L.; Freedman, B.; Powell, R. G.; Smith, C. R., Jr. (Northern Reg. Res. Cent., Agric. Res., SEA, USDA, Peoria, IL 61604) **Neriifolin and 2′-acetylneriifolin: insecticidal and cytotoxic agents of *Thevetia thevetioides* seeds.** *J. Econ. Entomol.* 73(3): 398-402; 1980 (24 references).

A bioassay procedure utilizing the European corn borer, *Ostrinia nubilalis* (Huebner), has been used to guide the phytochemical fractionation of active extracts of the seeds of a yellow oleander, *Thevetia thevetioides* (HBK.) K Schum. (Apocynaceae). The known cardiotonic glycosides, neriifolin and 2′-acetylneriifolin, were crystallized as the active insecticidal agents, giving LD50 determinations of 30 ppm and 192 ppm, respectively, when incorporated into the corn borer diet. These compounds also exhibited cytotoxic activities of 2.2×10^{-2} and 3.3×10^{-1} μg/ml, respectively, in the KB (human nasopharynx epidermoid carcinoma) *in vitro* system. The glucoside of β-sitosterol also was isolated but it lacked insecticidal activity. (Author abstract by permission)

80-2424. Bell, M. R.; Romine, C. L. (Western Cotton Res. Lab., SEA, Agric. Res., USDA, Phoenix, AZ 85040) **Tobacco budworm field evaluation of microbial control in cotton using *Bacillus thuringiensis* and a nuclear polyhedrosis virus with a feeding adjuvant.** *J. Econ. Entomol.* 73(3): 427-430; 1980 (10 references).

Field tests were conducted in 1978 at Phoenix, Az, to evaluate a feeding adjuvant, the nuclear polyhedrosis virus (NPV) from the alfalfa looper, *Autographa californica* (Speyer), and the HD-1 strain of *Bacillus thuringiensis* Berliner in controlling *Heliothis virescens* (F.) in cotton. When cotton that was planted on a normal planting date (April 21) was treated with the virus + a feeding adjuvant or virus + *B. thuringiensis* + the adjuvant, the percentage of squares and bolls damaged by *Heliothis* and the number of larvae in the fruiting forms were reduced 38-50 compared to numbers in untreated cotton. However, this reduction did not affect the yield of seed cotton. When cotton, planted late (June 26) to maximize tobacco budworm damage, was treated on a 5-, to 7-day schedule, yields of seed cotton in untreated plots, plots treated with virus alone, plots treated with virus + adjuvant, and plots treated with virus + *B. thuringiensis* + adjuvant were 332, 774, 1066 and 1427 kg/ha, respectively. Treatment with the virus + *B. thuringiensis* + adjuvant resulted in the boll damage never exceeding 5% and square damage never over 10%. In another late-planted area, the percentage of squares damaged by *Heliothis* in untreated plots, plots treated with *B. thuringiensis* alone, and plots treated with *B. thuringiensis* + adjuvant was 44.5, 18.3 and 8.8, respectively. The yield of seed control was 32% greater in cotton treated with the *B. thuringiensis* + adjuvant compared to the yield in cotton treated with the bacterium alone. Of *Heliothis* eggs examined during the tests, 89-98% were *H. virescens*, and the remainder were *H. zea* (Bloddie). (Author abstract by permission)

80-2425. Milborrow, B. V.; Vaughan, G. (Sch. Biochem., Univ. New South Wales, Kensington, New South Wales 2033, Australia) **Long term metabolism of (±)-(2-^{14}C)abscisic acid by apple seeds.** *J. Exp. Bot.* 30(118): 983-996; 1980 (16 references).

Studies were designed to elucidate the metabolism of (±)-(2-^{14}C)abscisic acid (ABA) by apple seeds. Seeds from ripe Jonathan apples were allowed to take up (^{14}C)ABA in a Petri dish, and were then transferred to a sterile flask for germination. Seeds were ground and extracted, and subjected to autoradiography, gas liquid chromatography, high pressure liquid chromatography and scintillation spectrometry. In addition, the $^{14}CO_2$ evolved from the seeds was trapped and counted. The apple seeds formed phaseic acid (PA), dihydrophaseic acid (DPA), and epi-DPA, all of which were converted into alkali-hydrolysable conjugates. The husks and embryos were sites of this metabolism. It was determined that $^{14}CO_2$ evolved from unsterilized seeds, but not from seeds surface-sterilized with sodium hypochlorite. When bacterial cultures obtained from soil and from rotting fruit were exposed to (^{14}C)ABA, the ABA was metabolized to a range of compounds, but not to phaseic or dihydrophaseic acids.

80-2426. Kim, C. H.; Murakami, Y. (Gyeongsang Natl. Univ., Jinju 620, Korea) **Ecological studies on *Formica yessensis* Forel, with special reference to its effectiveness as a biological control agent of the pine caterpillar moth in Korea. I. Geographical and ecological distributions of *Formica yessensis* Forel (Hymenoptera: Formicidae).** *J. Fac. Agric. Kyushu Univ.* 24(4): 239-245; 1980 (35 references).

The history of the red ant *Formica yessensis* with particular reference to the geographical habitat of this insect and its use as a biological control agent for the pine catepillar moth *Dendrolimus spectabilis* is presented. The ant may be found in Korea and China from the seashore to the mountains at elevations as high as 700 m. In Honshu it occurs as high as 700-1800 m in altitude. *F. yessensis* may also be found in Japan in open land adjacent to the forest margin, while in Korea its major habitat is in the pine forest because of the favorable light intensity. The red ant is an important natural enemy of the pine catepillar moth. Damage caused by the moths in pine forests where the ants reside is reported to be generally very low.

80-2427. Vekshin, B. S.; Bukina, H. V.; Pushkina, G. P.; Efimova, V. N. (All-Union Res. Inst. Drug Plants, Moscow, USSR) **Gerbitsdu na posevakh levzei saflorovidnoi. [Herbicides in Levsea crop.]** *Khim. Farm. Zh.* 14(4): 55-57; 1980 (3 references) (Russian).

The results of a series of herbicides in crops of the medicinal plant Levsea are reported. Patoran (metobromuron) and Arezin (monolinuron) provided the most effective and selective control of weeds in 1-yr plantations. Linuron and NOE 6128 were mildly toxic, while Kotoran (fluometuron) showed marked toxicity for Levsea plants. In 2nd and 3rd year plantations the herbicide Raundan caused yellowness of leaves and inhibition of plant growth.

80-2428. Berezovskii, M. I.; Khachatrian, A. R. (Armenian Agric. Inst., Erevan, USSR) **Novye otechestvennye triazinovye gerbitsidy. [New Soviet triazine herbicides.]** *Khim. Sel'sk. Khoz.* 18(4): 35-38; 1980 (Russian).

The results of trials of 14 newly synthesized alkylcyanamino-*sym*-triazines are reported. Information regarding the herbicidal activities as well as the toxicities and metabolic fates of the compounds are given. The highest herbicidal activity and broad spectrum of selectivity was recorded for 2-*N*-methyl-*N*-cyanamino-4,6-*bis*-*iso*propylamino-*sym*-triazine (Metazine). Metazine has a low toxicity for warm-blooded animals (LC50 for rats of 1600 mg/kg). Metazine showed relatively rapid degradation in the soil.

80-2429. Temchenko, V. A.; Karakashian, K. P.; Bokan', V. S. (Exp. Sel. Stn., Stavropol, USSR) **Smesi gerbitsidov na posevakh kukuruzy. [Herbicide mixtures in corn crop.]** *Khim. Sel'sk. Khoz.* 18(4): 42-43; 1980 (4 references) (Russian).

The effect of herbicide mixtures on the yield and chemical composition of corn grain was studied. Prior to drilling, a field was sprayed with binary and tertiary mixtures of linuron (2 and 3 kg/ha), prometryne (0.5, 1, and 2 kg/ha), and Treflan (trifluralin; 0.5 kg/ha). Tertiary mixtures provided control of weeds but inhibited (by 2 days) development of corn plants. Application of linuron and prometryne in combination with Treflan increased the level of lysine and tryptophan in the grain, which improved its nutritional value.

80-2430. Parshutin, S. M. (All-Union Res. Inst. Chem. Means Plant Prot., Moscow, USSR) **Simazin. [Simazine.]** *Khim. Sel'sk. Khoz.* 18(4): 61-62; 1980 (Russian).

Properties of the systemic herbicide simazine are described. Simazine is poorly soluble in water and is adsorbed actively by soil colloids, which results in a prolonged after-effect especially in soils with high humus content. The active ingredient is 2-chloro-4,6-*bis*-ethylamino-*sym*-triazine; the herbicide is formulated as 50% and 80% wettable powder. Toxicity is low for warm-blooded animals; the LC50 for rats is 5000 mg/kg. Maximum permissible concentrations of simazine in the air of the working zone is 2 mg/m^3.

80-2431. Zakirov, T.; Alkhas'iants, E. (Inst. Soil Sci., Tashkent, USSR) **Aktual'nye voprosy isopol'zovaniia ger-**

bitsidov. **[Current problems of the use of herbicides.]** *Khlopkovodsta* (3): 28-29; 1978 (Russian).

Various aspects of the use of herbicides in cotton crop are discussed. Extensive trials revealed that application of Kotoran (cotoran; fluometuron) resulted in the damage of cotton plants in light soils with low humus content following abundant precipitation, while Kotofor (cotofor; dipropetryn) was harmless to cotton crop. It was found that granulation of Kotoran (16, 20 and 24% AI) did not reduce its effectiveness against annual weeds. Preliminary experiments on the application of herbicides in combination with mineral fertilizers yielded positive results.

80-2432. Anonymous **Dioxin and the heart.** *Lancet* 1(8183): 1428; 1980 (5 references).

Studies done in cases where dioxin has been released to the areas surrounding chemical manufacturing plants are discussed in this letter to the editor. The Seveso and Coalite incidents are considered. It is concluded that the studies are not sufficiently detailed or complete. Lipid abnormalities and an apparent increase in heart problems among the Coalite workers are linked to the explosion at the 2,4,5-T manufacturing plant in 1968. However, the numbers of workers at this plant are not large enough for a significant epidemiological study. More follow-up studies, with particular reference to possible links to increased heart disease among exposed populations, are recommended.

80-2433. Doppelreiter, H. (Inst. Holzbiol. & Holzschutz, Bundesforschungsanstalt Forst & Holzwirtschaft, D-2050 Hamburg, BRD) **Die wirksamkeit von Diflubenzuron (Dimilin) auf Eilarven von *Hylotrupes bajulus* (L.). [The toxicity of diflubenzuron (Dimilin) to newly hatched larvae of *Hylotrupes bajulus* (L.).]** *Mater. Org.* 15(1): 47-52; 1980 (12 references) (German).

Larvae of the house longhorn beetle (*Hylotrupes bajulus* L.) were used in toxicity testing of diflubenzuron. The dose producing a complete kill or marginal survival ranged from 0.25-0.12 kg/m^3 wood during 8 wk incubation, and 0.06-0.03 kg/m^3 wood during 12 wk incubation. Surviving larvae were still found after 4 wk due to the mode of action of diflubenzuron. The need for further work on the applicability of diflubenzuron in wood preservation, its persistence, and application, are discussed.

80-2434. Undeen, A. H.; Colbo, M. H. (Res. Unit. Vector Pathol., Mem. Univ. Newfoundland, St. John's, Newfoundland A1C 5S7, Canada) **The efficacy of *Bacillus thuringiensis* var. *Israelensis* against blackfly larvae (Diptera: Simuliidae) in their natural habitat.** *Mosq. News* 40(2): 181-184; 1980 (5 references).

Field studies were performed to determine the suitability of bacteria as blackfly larvicides. *Bacillus thuringiensis* were cultured on tryptose blood agar, then suspended in water. Stream flows were calculated, then a calculated dose of 1×10^5 viable cells/ml for 1 min of flow was administered from a sprinkling can. Water samples were drawn during and after dosage at 15 sec intervals 10 m below the release point. Samples were removed to the laboratory for cell count determinations. Larvae were collected 1-2 hr after dosing from measured intervals downstream. These, plus controls (collected from upstream), were then reared in the laboratory, and mortality levels were reported after 48 hr. Mortalities of up to 100% occurred in some dosed areas. The flow rate of the stream appeared to be the major factor controlling the extent of downstream effect.

80-2435. Anonymous **Common pesticide causing concern.** *Nation's Health* 10(7): 14; 1980.

Concern about the possible hazards of 2,4-D are discussed. The EPA has stated that there is no current evidence that 2,4-D contains any form of dioxin (a contaminant of the related herbicide 2,4,5-T). Dioxin has been associated with cancerous tumors and possible birth defects. The use of 2,4-D each year in homes and on crops amounts to about 70 million lb (31.5 million kg) of active ingredient.

80-2436. Hay, A. (Author address not given) **Red faces (and hot tempers) on 2,4,5-T.** *Nature (London)* 286(5769): 97; 1980.

Controversy over the use of 2,4,5-T in the United Kingdom is discussed. The Royal Commission on Environmental Pollution approved the use of 2,4,5-T, in part due to the relatively small amount of that chemical thought to be used in Britain. The original estimate of annual 2,4,5-T use was 3 tons; the actual usage is 58 tons. This revised figure, plus the recent concern about the dioxin present as a contaminant in 2,4,5-T, has caused the PAC (Advisory Committee on Pesticides on the Ministry of Agriculture, Fisheries and Food) to review the situation. Trade unions are urging that 2,4,5-T be banned due to possible contamination with TCDD, and also due to the fact that the herbicide itself is a teratogen.

80-2437. Anonymous **Third World chemical plant produces the goods.** *New Sci.* 86(1206): 317; 1980.

A conference to discuss the potential uses of the Neem tree (*Azadirachta indica*), which is widely planted in India and West Africa, is described. Among the advantages of this tree are that it thrives in and improves impoverished soil, it reduces erosion, its seed produces an oil suitable for heating and for lubrication, and its fruit pulp may be useful as a substrate in methane gase generation. Neem seed kernels yield thioremone, a substance which has been shown to be a highly effective non-toxic insect repellant.

The seeds and leaves contain azadirachtin, which disrupts the feeding and growth of a number of insects and is retained even after a heavy rain. It is suggested as a possible replacement for DDT and other controversial insecticides.

80-2438. Handler, P. (Author address not given) **To study effects of Agent Orange on health.** *News Rep. Natl. Acad. Sci.* 30(7): 5; 1980.

The report of the panel investigation of the Proposed Air Force Study of Herbicide Orange is presented. The need for an in-depth study on the effects of Herbicide Orange (which contains 2,4,5-T and 2,4-D) on Vietnam veterans was recognized. However, the panel concluded that the proposed study plan would not identify adverse health effects due to exposure to the herbicide because of the small size of the study group and the relatively short time intended for follow-up of exposed military personnel. Suggestions were made for extending the scope and duration of the study. The sensibility of an Air Force appointed research team was also disputed on groups that the American public might later question the credibility or impartiality of the team's findings. It was suggested that the Air Force consider the public's perception of the Herbicide Orange issue when appointing a research team to investigate the possible health effects of the chemical on United States servicemen.

80-2439. Germini, G. (Lab. Nematol., ORSTOM, Dakar, Senegal) **Action du Furadan sur le developpement vegetatif de l'arachide. [Effect of furadan on growth of the peanuts.]** *Oleagineux* 34(10): 457-458; 1979 (6 references) (French).

Doses of 0.25, 0.5 and 1 g Furadan (AI carbofuran) were applied to single peanut plants growing in pots containing 5 kg soil. Abnormalities of leaf development (blistering and brownish necroses) were noted with all 3 dosages. Plants were removed from soil and weighed after 53 days. A significant increase in dry of aerial parts and roots was found in plants that received the 0.25 g dose. It is concluded that low dosage of Furadan have a positive effect on peanut growth.

80-2440. Kumar, A.; Tewari, G. D.; Pandey, N. D. (Univ. Kanpur, Kanpur, India) **Studies on the antifeeding and insecticidal properties of bitter gourd *(Momordica charantia* L.) against mustard sawfly *Athalia proxima* Klug.** *Pesticides* 13(12): 9-11; 1979 (7 references).

Bitter gourd seed oil from *Momordica charantia* L. was tested as an antifeedant insecticide against the mustard sawfly. Emulsions of Tween 80 and 0.5%, 1% and 2% seed oil were prepared and sprayed on mustard leaves in four randomized treatments with four replications. At 24 and 48 hr after release of 5 larvae over the leaves, feeding habits and mortality of the larvae were recorded. Field experiments on a 2.4 m^2 plot with five replications were also performed and larvae mortality was recorded at 24, 48, and 72 hr after release. At 24 hr, mortality ranged from 80 to 85% (median 82.7%) when 2% emulsions were used in the laboratory experiments. At 48 hr, 100% mortality was recorded. Significantly higher mortality occurred in gourd seed oil treatments over controls and 2% emulsions were significantly more effective than the other treatments. In the field trial, 44% larvae mortality was observed at 24 hr and 100% mortality occurred by 48 hr when the 2% emulsion was used. The results indicate that bitter gourd seed oil may be used as an alternative to chemical pesticides.

80-2441. Singh, D. V.; Singh, R. R. (Div. Plant Pathol., Chandra Shekar Azad Univ. Agric. & Technol., Kanpur 2, India) **Search of safer fungicides for treating pea seeds in combination with rhizobium.** *Pesticides* 14(1): 34-35; 1980.

Seeds of the pea variety T 163 were treated separately with each of 6 fungicides Bavistin (carbendazim), Brassicol (quintozene), captan, Ceresan dry (PMA), Dithane M-45 (mancozeb) and thiram, and in combination with *Rhizobium*, in the first year. During the second growing season, BASF 3860 IF was also used. The highest germination was recorded in seeds treated with Ceresan dry, followed by Bavistin in combination with *Rhizobium* during 1973-74 and in Bavistin treated seeds followed by treatment with thiram in the next season. However, the treatments did not differ significantly among themselves nor from controls. The highest number of nodulations was also obtained in seeds treated with Bavistin combined with *Rhizobium* during both years.

80-2442. Wong, M. H. (Dep. Biol., Chinese Univ. Hong Kong, Shatin, Hong Kong) **Agricultural wastes and freshwater supply in Hong Kong.** *Prog. Water Technol.* 11(6): 121-132; 1979 (32 references).

Problems associated with the water supply of the densely populated area of Hong Kong are reviewed. A physical description of the area is presented, along with a summary of the population growth, industrialization, urbanization and development of agriculture. Agricultural waste is the greatest cause of water pollution in this region. It is noted that agricultural wastes include fertilizers, pesticides, and pig and poultry effluent. Among the topics discussed are the building of sewage treatments plants and reservoirs, the recycling of pig and poultry waste and the development of integrated farming systems.

80-2443. Rubio, J. L. (Inst. Agroquim. & Tecnol. Aliment, Valencia 10, Spain) **Agroquimica: plaguicidas fertilizantes, etc. Inhibidores de la nitrificacion. [Agrochemistry: pesticides, fertilizers. Nitrification in-**

hibitors.] *Rev. Agroquim. Technol. Aliment.* 19(4): 435-442; 1979 (7 references) (Spanish).

Studies on the nitrification process and nitrification inhibitors are reviewed. When used in normal doses, the majority of the herbicides do not inhibit the nitrification processes in the soil. In general, soil fumigants and fungicides have a more potent nitrification inhibiting effect than insecticides and herbicides.

80-2444. Puzikov, L. S.; Shustrov, V. S. (All-Union Sugar Beet Res. Inst., Kiev, USSR) **Smes' gerbitsidov - na vegetiruiuschchei svekle. [Herbicide mixtures for vegetating beet stands.]** *Sakh. Svekla* (5): 37-38; 1980 (Russian).

The effects of various herbicide treatments on plant density, crop yields, and sugar content in sugar beets were studied. In one test, post-emergence treatment was performed with lenacil, betanal, or betanal (phenmedipham) + lenacil. The sugar content in the beets was 17.4-17.9% versus 17.5-17.6% without herbicides. In another, the same herbicides were applied after tillam (pebullate) treatment (6 kg/ha). The sugar level in the beets was 18-18.1% versus 18% in the untreated control. The findings indicate that the treatments cause no significant changes in the sugar content of sugar beets.

80-2445. Sergeev, G. I. (All-Union Sugar Beet Res. Inst., Kiev, USSR) **Gerbitsidy, gustota vskhodov i produktivnost' svekly. [Herbicides, plant density, and beet crop yields.]** *Sakh. Svekla* (5): 39-40; 1980 (Russian).

The effects of different post-emergence herbicide treatments on sugar beet plant density, crop yields, and sugar content in the beets were studied. The herbicide combinations used with betanel were (phenmedipham), TCA + lenacil, TCA + phenazone (antipyrine) eptam (EPTC), eptam + TCA, ronit (cycloate) + TCA, and ronit + phenazone. The treatments caused no significant changes in plant density and in the sugar level of the beets compared with the untreated controls. Sugar levels were 18.5-18.9% versus 18.8-19.2% in the controls.

80-2446. El-Sebae, A. H.; Sherby, S. M.; Mansour, N. A. (Div. Pestic. Chem., Fac. Agric., Univ. Alexandria, Alexandria, Egypt) **Gossypol: suppresses development and inhibits protease and lipid peroxidation activities of *Spodoptera littoralis*.** *Toxicol. Lett.* 5(Sp 1): 51; 1980.

The Egyptian cotton leafworm *(Spodoptera littoralis)* was tested for its response to gossypol, a substance which occurs naturally in the pigment glands of cotton and is toxic to some phytophagous insects. There was no remarkable toxicity in larvae treated topically with up to 125 μg/larvae. When gossypol was incorporated into the diet at a concentration of 1.5% it reduced the larval weight to within 50% of the control within 2 days, and increased the number of days required for each stage. When the compound was administered to 3 successive generations, the number of eggs and percent hatchability were decreased to 0% of the control in the third generation. The activities of larvae protease and lipid peroxidation enzyme were inhibited. [Abstract O.71 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2447. Mellerio, F. (Unite Rech Toxicol. Exp., INSERM, Hop. Fernand Widal, F-75010 Paris, France) **Results and perspectives of electroencephalography in toxicology.** *Toxicol. Lett.* 5(Sp 1): 154; 1980.

The role of electroencephalography in providing data on toxicological studies and toxic nervous disturbances is discussed. Conclusions from first hand study of about 4300 observations are reported. Topics considered include diagnostic orientation; prognostical orientation; problems of therapeutic complications; and supervision of therapeutics, including hypoxia treatment of paraquat poisoning. It is noted that among the categories of toxins requiring further study are insecticides, including hydrocarbons and organophosphates. [Abstract P.57 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2448. Anonymous **Dispute resolution conference on 2,4,5-T.** *Vet. Hum. Toxicol.* 22(1): 40-42; 1980.

Conclusions from a workshop to discuss the major areas of disagreement over 2,4,5-T are presented. Carcinogenicity and mutagenicity testing on animals have not positively shown 2,4,5-T to be either a carcinogen or a mutagen. TCDD has, however, been shown to be carcinogenic in rats and mice, and mutagenic in two bacterial reverse mutation systems. The effects of 2,4,5-T on the reproductive parameters in animals and humans are listed. Conclusions on similar studies for TCDD are also presented. Symptoms, such as chloracne, which occur in humans following TCDD exposure are discussed. Ecological effects of TCDD are considered, including the rapid degradation of TCDD upon exposure to sunlight and the 1-3 yr half-life of TCDD in soil. Data from studies on attempts to detect TCDD in breast milk, beef fat, beef liver, bovine milk, fish and wildlife are listed. Benefits obtained through 2,4,5-T use are also discussed.

80-2449. Wang, J. Y. (Dep. Meteorol., San Jose State Univ., San Jose, CA 95192) **Agricultural activities affecting weather and climate.** *Water Air Soil Pollut.* 12(1): 71-73; 1980.

Agricultural activities which affect the local and possibly global weather and climate are discussed briefly. These agricultural activities are grouped under three general headings: application of agrochemicals, soil management techniques, and irrigation management. The application of chemicals to the soil may result in at-

mospheric disturbances and diminished air quality because the chemicals enter the air and remain dispersed in the air for some period of time.

80-2450. Shaner, D. L.; Lyon, J. L. (Dep. Bot. & Plant Sci. Univ. California, Riverside, CA 92521) **Interaction of glyphosate with aromatic amino acids on transpiration in *Phaseolus vulgaris*.** *Weed Sci.* 28(1): 31-35; 1980 (10 references).

When glyphosate [*N*-(phosphonomethyl) glycine] was fed through the transpiration stream of excised bean (*Phaseolus vulgaris* L. Red Kidney) shoots, it was readily absorbed and transported to the leaves where it inhibited transpiration. Maximum inhibition (40 to 50%) resulted from tissue concentrations of 50-3000 nmoles glyphosate/g fresh wt, while transpiration was significantly inhibited (20%) by as little as 15 nmoles/g fresh wt. A combination of 5×10^{-4} *M* tyrosine (Tyr) and 5×10^{-4} *M* phenylalanine (Phe) supplied continuously through the transpiration stream prevented the inhibition of transpiration by glyphosate during the course of 8 hr experiments. Tyr (10^{-4} *M*) alone delayed the transpiration response to glyphosate by 2-3 hr but 10^{-4} *M* Phe alone did not affect the inhibition by glyphosate. Levels of endogenous Tyr and Phe were about 50% lower in glyphosate-treated leaves than in the controls 6 hr after treatment. (Author abstract by permission)

80-2451. McWhorter, C. G.; Williford, J. R. (South. Weed Sci. Lab. & Field Crops Mech. Res. Unit., Agric. Res. SEA, USDA, Stoneville, MS 38776) **Factors affecting the toxicity of glyphosate applied in the recirculating sprayer to johnsongrass *(Sorghum halepense)* and soybeans *(Glycine max)*.** *Weed Sci.* 28(1): 59-63; 1980 (14 references).

Field experiments were conducted to determine optimum nozzle settings for applying glyphosate [*N*-(phosphonomethyl)glycine] in the recirculating sprayer for post-emergence control of johnsongrass [*Sorghum halepense* (L.) Pers] in soybeans [*Glycine max* (L.) Merr.]. Herbicide sprays were directed across the row to johnsongrass growing taller than soybeans in July and August. Herbicide not sprayed on johnsongrass was trapped and reused. Glyphosate at 0.56, 1.12 and 2.24 kg/ha applied with commerically available 25° spray nozzles provided johnsongrass control and soybean yields equal to those following applications with specialized uniform droplet nozzles. Glyphosate at 1.7 kg/ha applied in the recirculating sprayer using only one nozzle per row provided control of johnsongrass equal to or better than that from applications made with two, three, or four nozzles per row. Soybean yield following application of glyphosate at 1.7 kg/ha with one nozzle per row was equal to yields obtained following its application with two, three, or four nozzles per row, with or without surfactant at 0.1% in spray solutions. Soybean injury was lower and yield was higher when glyphosate was applied in the recirculating sprayer rather than over the top with a conventional sprayer. Glyphosate at 1.12 kg/ha applied in the recirculating sprayer caused more injury to Hill and Bragg than to Forrest or Tracy soybeans. (Author abstract by permission)

80-2452. Goldstein, M. (Author address not given) **After Agent Orange: the defoliation of Vietnam.** *Yale Sci.* 54(4): 8-11; 1980.

This paper briefly discusses the aftermath of the spraying of Agent Orange (2,4-D and 2,4,5-D), Agent White (picloram and 2,4-D), and Agent Blue (arsenic, 54%) in the jungles of South Vietnam. This spraying has severely affected the complex balance in the ecosystems exposed to the chemicals, particularly on mangrove forest areas. Immediately destroyed were 56% of these forests and their fauna. Wildlife in the areas which were defoliated were forced to seek new food supplies and shelter with the result that many of these populations were severely diminished. Soil in Vietnam has not as yet recovered. Soil erosion has intensified. Nutrient-dumping has made the soil too poor to sustain vegetation which had previously flourished. Concern about TCDD contamination of soils, plants and humans in Vietnam are also discussed.

80-2453. Sasaki, S.; Watanabe, K.; Hayashi, S.; Sugaya, H. (Inst. Rural Med., Hirage Gen. Hosp., Hiraga, Akita, Japan) **[Residual amount of organochlorine pesticides and PCBs in human bodies.]** *Akita-Ken Noson Igakka Zasshi (Akita J. Rural Med.)* 26(2): 38; 1980 (Japanese).

Results of an investigation on residues of organochlorine pesticides and PCBs in humans are reported. Of the 158 samples collected, 43 were adipose tissue, 23 were liver, 22 were kidney, 22 were spleen and 48 were breast milk. *p,p'*-DDE and β-BHC were detected in all specimens investigated. β-BHC levels in human milk (0.082 ppm in 1971) decreased to 0.035 ppm in 1978. *p,p'*-DDE in both breast milk and adipose tissues decreased to 0.050 ppm from 0.065 ppm for the same time period. No significant correlation was observed between residues of β-BHC and the occurrence of disease. A significant inverse correlation was observed between the total body surface area and the amounts of *p,p'*-DDE. Residue levels of organochlorine pesticides in several organs in 1978 were somewhat lower than levels observed in 1977.

80-2454. Marinucci, A. C.; Bartha, R. (Dep. Biochem. & Microbiol., Cook Coll., New Jersey Agric. Exp. Stn., Rutgers Univ., New Brunswick, NJ 08903) **Biodegradation of 1,2,3- and 1,2,4-trichlorobenzene in soil and in liquid enrichment culture.** *Appl. Environ. Microbiol.* 38(5): 811-811; 1979 (23 references).

The biodegradation of radiochemically pure (99%) 1,2,3- and 1,2,4-trichlorobenzene (TCB) in soil was investigated. Experimental difficulties posed by the high volatility and slow biodegradation rates of the TCBs were partially overcome by using a specially designed incubation and trapping apparatus. Evolution of $^{14}CO_2$ from active *vs.* poisoned soil dosed with 50 μg of the individual TCBs/g gave conclusive proof that both isomers are biodegradable. At 20°C, 1,2,4-TCB was mineralized at an approximate rate of 1 nmol/day/20 g of soil sample, and 1,2,3-TCB was mineralized at one-half to one-third that rate. Mineral fertilizers or cosubstrates failed to increase TCB mineralization rates in soil. Anaerobic conditions had a negative effect on mineralization, and increased temperatures had a positive effect. With increasing 1,2,4-TCB concentrations, $^{14}CO_2$ evolution exhibited saturation kinetics with an apparent K_m of 55.5 nmol/g soil. Recovery of total radioactivity was good from soil containing high organic matter concentrations. From low-organic-matter soil, some of the radioactivity was recovered only in combustion, and overall recovery was lower. In soil-inoculated liquid culture, the cosubstrates glucose and benzene caused a slight stimulation of 1,2,4-TCB mineralization. Cochromatography of known standards with the extracts of soil pretreated with [^{14}C]TCBs indicated that 3,4,5-trichlorophenol, 2,6-dichlorophenol and, to a lesser degree 2,3-dichlorophenol were present in soils incubated with 1,2,3-TCB. 2,4-, 2,5-, and 3,4-dichlorophenol were present in soils incubated with 1,2,4-TCB. (Author abstract by permission)

80-2455. Larson, R. J. (Environ. Saf. Dep., Proctor & Gamble Co., Cincinnati, OH 45217) **Estimation of biodegradation potential of xenobiotic organic chemicals.** *Appl. Environ. Microbiol.* 38(6): 1153-1161; 1979 (15 references).

A method is described to estimate the biodegradation potential of soluble, insoluble, and unknown organic chemicals. The method consists of two stages: (i) generation of a microbial inoculum in a bench scale semicontinuous activated sludge system during which microorganisms are acclimated to test material and the removal of dissolved organic carbon is monitored and (ii) biodegradability testing (CO_2 evolution) in a defined minimal medium containing the test material as the sole carbon and energy source and a dilute bacterial inoculum obtained from the supernatant of homogenized activated sludge generated in the semi-continuous activated sludge system. Removal and biodegradation are measured using nonspecific methods, at initial concentrations of 5-10 mg of dissolved organic carbon/liter. Biodegradability data are accurately described by a nonlinear computer model which allows the rate and extent of biodegradation for different compounds to be compared and statistically examined. The evaluation of data generated in the combined removability-biodegradability system allows the biodegradation potential of a variety of xenobiotic organic chemicals (including pesticides) to be estimated. (Author abstract by permission)

80-2456. Heesen, T. C.; Young, D. R.; McDermott-Ehrlich, D. (South. California Coastal Water Res. Proj., El Segundo, CA 90245) **Evaluation of a technique for measuring dry aerial deposition rates of DDT and PCB residues.** *Atmos. Environ.* 13(12): 1677-1680; 1979 (13 references).

A rapid technique for determining dry aerial fallout rates of DDT and PCB was evaluated. Oiled glass plates were placed on a rooftop, then scraped at the end of the sampling period. The scrapings were placed in centrifuge tubes and returned to the laboratory where they were analyzed by gas chromatography. Collection efficiency decreased with duration of plate exposure, especially for compounds more volatile than *p,p'*-DDE. Tests were performed to test the efficiency of oil replacements (glycerin, silicon oil, and water), but none were as efficient as mineral oil. It was shown that PCB and DDT residues were collected equally efficiently on dry ice as on the oil plates. Because of the increased ease, economy and longer duration time of the oil method, it is recommended over the dry ice method. Average means for 8-day samples were 311 ng *p,p'*-DDT, 109 ng *o,p'*-DDT, 39 ng *p,p'*-DDE, 103 ng *p,p'*-DDD (*p,p'*-TDE), 561 ng ΣDDT and 187 ng 1245 PCB. Dieldrin and Aroclor 1242 were found to have low recoveries in the 8-day experiment, possibly due to higher volatility and or photolysis.

80-2457. Heritage, A. D.; MacRae, I. C. (Div. Irrig. Res., CSIRO, Griffith, New South Wales 2680, Australia)

Degradation of hexachlorocyclohexanes and structurally related substances by *Clostridium sphenoides*. *Aust. J. Biol. Sci.* 32(4-5): 493-500; 1979 (23 references).

The pathway of degradation of the γ-isomer of 1,2,3,4,5,6-hexachlorocyclohexane (γ-HCH; γ-BHC; lindane) by the bacterium *Clostridium sphenoides* was studied. Cell suspensions were incubated with γ-HCH under anaerobic conditions, with pH ranging from 5-10 and temperature ranging from 30-60°C. Chlorinated substances were extracted with *n*-hexane and analyzed with a gas chromatograph equipped with an electron capture detector. Optimal conditions for γ-HCH metabolism were found to be 40°C and pH 8.0. The metabolism of 4 common isomers of HCH and structurally related substanees by *C. sphenoides* was also studied. The γ-HCH-adapted suspensions metabolized the β-, γ- and δ-isomers of 3,4,5,6-tetrachloro-1-cyclohexene, 2,3,4,5,6-pentachloro-2-cyclohexen-1-ol, γ-1,2,3,4,5,6-pentachlorocyclohex-1-ene and 1,2,3,4,5-pentachlorocyclohexane. The suspensions did not metabolize a selection of chlorinated benzenes, dichlorocyclohexane and chlorocyclohexane.

80-2458. McDougall, K. W.; Heath, A. B.; Black, R. R. (Dep. Agric., Lismore, New South Wales, Australia) **Residues of amitraz in the tissues, milk and butter of cattle dipped in Taktic.** *Aust. J. Exp. Agric. Anim. Husb.* 19(101): 663-665; 1979 (2 references).

A series of experiments was carried out to determine residues of amitraz in milk, butter and tissues of cattle after dipping in the acaricide Taktic, which contains amitraz. Tissue samples from young steers were collected 24 and 48 hr after dipping. Whole milk and butter fat samples were collected from dairy cows immediately prior to dipping, and twice daily for the following 7 days. In addition, samples of manufactured butter were collected. All samples were analyzed for amitraz by gas chromatography. Amitraz residues were below the minimum detectable limit of 0.02 mg/kg in tissue samples from steers slaughtered 24 and 48 hr after dipping. In milk and butter samples, amitraz residues reached maximum 6 hr after dipping (milk 0.01 mg/kg and butter 0.17 mg/kg), with levels declining to 0.01 mg/kg 2 days after treatment. All factory-produced butter contained less than 0.01 mg/kg amitraz, well below the MRL of 0.1 mg/kg. It is concluded that amitraz levels in tissues and commercially produced milk and butter are well below the MRL when Taktic is applied according to correct agricultural practice.

80-2459. Asher, C. J.; Reay, P. F. (Dep. Agric., Univ. Queensland, St. Lucia, Queensland 4067, Australia) **Arsenic uptake by barley seedlings.** *Aust. J. Plant Physiol.* 6(4): 459-466; 1979 (27 references).

Arsenate and arsenite (arsenic trioxide) uptake by intact barley plants was studied at pH 5.0. Arsenate uptake demonstrated an initial phase which was rapid and apparently irreversible. This was followed by a slower period of uptake, a steady state phase. Both phases of arsenate uptake were temperature sensitive and strongly inhibited by phosphate. A high degree of correlation was noted between the initial and steady state phases of arsenate uptake. Uptake of arsenite also exhibited initial and steady state phases. However, uptake was 3-4 fold slower than arsenate uptake at the same concentration.

80-2460. Cerniglia, C. E.; Dodge, R. H.; Gibson, D. T. (Dep. Microbiol., Univ. Texas Austin, Austin, TX 78712) **Studies on the fungal oxidation of polycyclic aromatic hydrocarbons.** *Bot. Mar.* 23(2): 121-124; 1980 (24 references).

Many polycyclic aromatic hydrocarbons are present as pollutants of oceans and estuaries. The role of fungi in degrading these compounds has been investigated in previous experiments. The fungus *Cunninghamella elegans* isolated from soil collected along the North Carolina coast has been shown to oxidize naphthalene, biphenyl, and dibenzofuran to metabolites similar to those found in mammalian enzyme systems. In the present study the ability of *C. elegans* to metabolize the aromatic hydrocarbons benzo(a)pyrene and benzo(a)anthracene was examined. Fermentation with the fungi was conducted in Erlenmeyer flasks on Sabouraud dextrose broth. After 72 hr the cultures were harvested and transferred to fresh medium containing either labeled benzo(a)pyrene or benzo(a)anthracene. After incubation for 6 or 12 hr, the contents of the flasks were analyzed by HPLC. The radioactivity present in each fraction was determined by liquid scintillation counting. Results showed several metabolites with identical retention times to oxidation products that are formed by mammalian enzyme systems.

80-2461. De Filippis, L. F. (Dep. Bot., La Trobe Univ., Bundoora, Victoria 3083, Australia) **Non-enzymatic reduction of organomercurial salts in biological systems.** *Bull. Environ. Contam. Toxicol.* 23(6): 848-854; 1979 (22 references).

Laboratory studies were designed to elucidate non-biological (non-enzymic) transformation reactions involving organomercurial compounds. Mercury (^{203}Hg) volatilization was tested by adding (^{203}Hg) phenylmercuric acetate (PMA) to distilled H_2O or an inorganic culture medium, at pH 5.0 or 8.0. The species of Hg evolved were identified by using three traps in series: carbonate-phosphate absorption solution for methyl and ethyl mercury; acid permanganate for collection of elemental Hg; and gold foil for other organomercurials. ^{203}Hg was measured using liquid scintillation. It was determined that 1.0 μl/l of ethylene or acetylene volatilized Hg from solutions. Over 85% of the volatilized Hg was in the acid-permanganate trap, suggesting that most of the volatile Hg was in the metal form (Hg^0). The reaction is light mediated, pH dependent, inhibited by 20 μ*M* $AgNO_3$ and 3 *M* Na_2S, but is largely independent of oxygen concentration. The

mechanism of Hg volatilization is discussed, and it is suggested that unsaturated hydrocarbons play an important role in the reduction and possibly the alkylation of Hg in biological systems.

80-2462. Parlar, H.; Korte, F. (Inst. Okol. Chem., Ges. Strahlen & Umweltforsch. mbH Muenchen, D-8050 Freising-Attaching, BRD) **Photokinetische Bewertung von Dechlorierungsreaktionen der Cyclodieninsektizide. [Photokinetic evaluation of dechlorination reactions of cyclodiene insecticides.]** *Chemosphere* 8(11-12): 873-876; 1979 (10 references) (German).

The photodechlorination mechanism of cyclodiene insecticides in *n*-hexane was studied gas chromatographically with chlordane, bromochlordane, aldrin, dieldrin and 4 similar compounds. Homolytic Cl-radical splitoff induced by the excitation of the molecule was identified as the first dechlorination step. This radical spontaneously attacks the proton donor present in the form of the solvent (*n*-hexane) resulting in the eventual formation of a stable olefin. Dechlorination of chlordane derivatives was found to proceed slower than that of dimethanonaphthalene derivatives. The irradiation of β-dihydroheptachlor in the presence of various triplet sensitizing agents revealed that dechlorination depended on the nature of the agent, a phenomenon not observed in other irradiated cyclodienes. Cyclodiene dechlorination proceeds over monodechlorinated compounds to doubly dechlorinated photoproducts resulting from the replacement of both chlorine atoms on the C=C bond by hydrogen atoms.

80-2463. Meallier, P.; Pouyet, B.; Badin, J.; Bastide, J.; Coste, C. (Lab. Photochim., U.E.R. Chim. Biochim., Univ. Claude Bernard Lyon I-43, F-69622 Villerubanne, France) **Photodegradation des molecules phytosanitaires. III. Photodegradation du propyzamide. [Photodegradation of pesticides. III. Photodegradation of propyzamide.]** *Chemosphere* 9(2): 105-109; 1980 (7 references) (French).

The effect of light on the degradation mechanism and the nature of the decomposition products of propyzamide (pronamide; Kerb) were studied by Xenon Lamp irradiation of the pesticide in *n*-hexane and in water and ethyl alcohol and subsequent spectral analysis and chromatography. Two mechanisms caused by excitation by UV bombardment and consequent transfer of intramolecular charges were identified as the operative causes of the replacement of chlorine atoms by hydrogen atoms and the elimination reactions. The metabolites identified by mass spectrometry included isopropyl methyl ketone, ethyl methyl ketone, acetone, acetaldehyde, oxazoline II, *N*-(dimethyl-1, 1-propynyl-2)-chloro-3-benzamide, *N*-ethyl benzamide, dichloro-3,5-benzamide, chloro-3-benzamide, *N*-(dimethyl-1, 1-propanone-2-hydroxy-3)-dichloro-3,5-benzamide and *N*-(dimethyl-1, 1-ethanol-2)-dichloro-3,5-benzamide.

80-2464. Eder, G.; Weber, K. (Inst. Meeresforsch., D-2850 Bremerhaven, BRD) **Chlorinated phenols in sediments and suspended matter of the Weser estuary.** *Chemosphere* 9(2): 111-119; 1980 (16 references).

Levels and pattern of chlorophenols in sediments and suspended matter of the Weser estuary in Germany were determined. At 15 sampling sites sediments were collected with a grab sampler and suspended matter was obtained from turbid river water. Chlorophenol acetates were extracted, then identified and quantified by gas chromatography with electron capture detection. The reliability of results was checked by mass spectrometry. Pentachlorophenol (PCP) generally predominated, and 2,3,4,6- and/or 2,3,5,6-tetrachlorophenols were always be found together with PCP. Also found were 2,4- and 2,5-dichlorophenol (DCP) and 2,4,5- and 2,4,6-trichlorophenol (TrCP). A positive correlation existed between the chlorophenol content and the water-holding capacity of the sediment. Possible sources of the chlorophenols found are discussed. It is mentioned that 2,4-DCP and 2,4,5-TrGP have been shown to be formed from 2,4-D and 2,4,5-T in anaerobic sediment. The microbial transformation of lindane and chlorobenzene has also been reported to produce PCP and lower chlorinated phenols.

80-2465. Pemberton, J. M.; Corney, B.; Don, R. H. (Dep. Microbiol., Univ. Queensland, St. Lucia 4067, Australia) **Evolution and spread of pesticide degrading ability among soil micro-organisms.** *Dev. Genet.* 1: 287-299; 1979 (22 references).

Studies were conducted to determine the nature of the evolution of pesticide degrading ability of soil bacteria. Bacteria from 1 g soil samples were isolated on peptone yeast extract containing various forms of phenoxyacetic acid (MCPA, 2,4-D and 2,4,5-T). Fifty soil samples were screened for the presence of 2,4-D degrading microorganisms. Thirty-eight of the 50 samples demonstrated pesticide reduction. Based on these studies, genetic mapping and DNA isolation, it is concluded that the evolution of the ability of degrade 2,4-D occurs by plasmid borne gene duplication and mutation.

80-2466. Ferris, I. G. (Univ. Wisconsin, Madison, WI) **The interaction of agricultural chemicals and environmental factors on the fate of parathion in soils.** *Diss. Abstr. Int. B* 40(12): 5529; 1980.

The fate of ^{14}C-parathion in a loam and cranberry soil was investigated utilizing a closed system to enable monitoring of $^{14}CO_2$ evolution, and to obtain a total ^{14}C balance. Soils were treated with ^{14}C-parathion at rates equivalent to about 3 ppm, and incubated at 23 ± 2°C. After 3 wk incubation, differences in the persistence of ^{14}C-parathion were evident: 76% of applied radiocarbon remained as unchanged parathion in loam soil compared with only 4% in cranberry soil; conversely, ^{14}C degradation products amounted to 26 and 91% of applied radiocarbon,

respectively. The rapid degradation of ^{14}C *(ring)* parathion in cranberry soil proceeded via 2 principal pathways. The formation of bound ^{14}C parathion residues primarily involves the reduction of ^{14}C parathion to soil bindable ^{14}C-amino compounds. Parathion or *p*-nitrophenol treatments applied to cranberry soil 4 days before application of ^{14}C parathion, resulted in a multiplication of aerobic bacteria and accelerated the degradation of ^{14}C *(ring)* parathion in comparison with untreated controls. The population of aerobic bacteria in cranberry soil was suppressed by autoclaving or 60°C aerated steam and no degradation of ^{14}C-parathion occurred. Interactions were found to occur between fungicides and the biodegradation of ^{14}C *(ring)* parathion in cranberry soil. Captafol inhibited the metabolism of ^{14}C-parathion. The inhibition was a linear function of the applied captafol concentration. Maneb or benomyl at 100 ppm altered the pathway of ^{14}C-parathion degradation in favor of bound ^{14}C-parathion. Soil amendments of 100 ppm nitrogen as $(NH_4)_2SO_4$, or to a lesser extent KNO_3, inhibited the metabolism of ^{14}C *(ring)* parathion to $^{14}CO_2$. The inhibitory effect of $(NH_4)_2SO_4$ was not related to the toxic action of NH_4^+-N, or to its effect on soil pH. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8007551)

80-2467. Ocker, H. D.; Seibel, W. (Author address not given) **Rueckstandssituation bei Getreide und Brot. [Pesticide residues in grain and bread.]** *Dtsch. Lebensm. Rundsch.* 75(11): 354; 1979.

Regular testing of rye and wheat harvest samples has revealed a steady decrease (beginning in 1975) of median contamination levels of these cereals with lindane, HCB (hexachlorobenzene), DDT and α-HCH (α-BHC). Lindane was found to have spread to the entire ecosphere and was identified as a contaminant in all samples of cereals at levels two orders of magnitude below the maximum permissible level. Tests performed on bread revealed that levels of contamination were almost identical with those found in the flour from which the bread was baked. Accidental contamination during storage, contaminated imported flour or contaminated baking additives were identified as only exceptional sources of contamination.

80-2468. Ellgehausen, H.; Guth, J. A.; Esser, H. O. (Agric. Div., Ciba-Geigy Ltd., Basel, Switzerland) **Factors determining the bioaccumulation potential of pesticides in the individual compartments of aquatic food chains.** *Ecotoxicol. Environ. Saf.* 4(2): 134-157; 1980 (29 references).

Bioaccumulation of *p,p'*-DDT, fluorodifen, profenofos, terbutryn, atrazine, metolachlor, monuron, thiazafluron, CGA 49 988 and 2,4-D was studied in a simplified ecosystem containing an algae, *Scendesmus acutus*, a crustacean, *Daphnia magna*, and the catfish, *Ictalurus melas*. After a single exposure of the individual species to the chemical under study, rapid uptake of pesticides was noted. Conditions near equilibrium were reached after 0.5, 6 and 24 hr with algae, daphnids and catfish, respectively. It was also noted that the rate of release of pesticide residues from aquatic organisms was dependent on the pesticide concentration in the organism. Daphnids were fed pesticide treated algae, or fish were fed pretreated daphnids. The results indicate that the uptake of pesticides from food is far less important than the uptake from water, and that only a part of the residue present in the lower level is transferred to the higher level of the food chain.

80-2469. Miller, C. O. M. (Process Math Model. Syst. Res. Lab., Cent. Res., Dow Chem. USA, Midland, MI 48640) **A mathematical model of aerial deposition of pesticides from aircraft.** *Environ. Sci. Technol.* 14(7): 824-831; 1980 (33 references).

In order to maximize the benefits associated with the utilization of chemical pesticides, a mathematical analysis was developed. Twenty-eight sets of deposition observations were analyzed, and a numerical assessment of the spatial distribution of active material, both on-target and downwind of the target area, is described. The stirred settling from a volume source model offers the advantage of a systematic approach to data analysis, and has been useful in determining spray droplet particle size distribution parameters used in spray nozzle system comparison studies. For the herbicide treatments studied (triclopyr, 2,4-D, picloram, and 2,4,5-T), the values of the mass median spray droplet diameter and the percent of spray mass under 100 μm were typically 250 μm and 3%, respectively. On-target recovery of the herbicide was in the 70-80% range. (Author abstract reprinted by permission of the American Chemical Society)

80-2470. Ristow, D.; Conrad, B.; Wink, C.; Wink, M. (Tierhyg. Inst., Univ. Freiburg, D-7800 Freiburg, BRD) **Pesticide residues of failed eggs of Eleonora's falcon *Falco eleonorae* from an Aegean colony.** *Ibis* 122(1): 74-76; 1980 (13 references).

Organochlorine pesticide residues and metabolites were determined in failed eggs of an Aegean Sea colony of Eleonora's falcon *(Falco eleonorae)*. All failed eggs from 1977 (26 of 319 laid in 140 nests) were collected. Half (13) were analyzed for organochlorines by gas chromatography with electron capture detection. The eggshell indices were calculated and correlations of pesticide residues and the eggshell index were determined. No lindane, heptachlor or heptachlor epoxide residues were found. In relation to dry weight, the average levels of HCB (hexachlorobenzene) were 0.143 ppm; DDE, 8.31 ppm; dieldrin, 0.023 ppm; and PCBs, 2.18 ppm. Eggshell thicknesses and eggshell indices did not differ appreciably from those of eggs collected from 1864 to 1928. Some hypotheses, which could explain the low levels of pesticides observed, are discussed, and the results of this study are compared to other studies.

80-2471. Furness, R. W.; Hutton, M. (Zoology Dep., Glasgow Univ., Glasgow G12 8QQ, Scotland) **Pollutants and impaired breeding of Great Skuas *Catharacta skua* in Britain.** *Ibis* 122(1): 88-94; 1980 (43 references).

Studies were designed to determine the breeding success of the seabird Great Skua at 2 colonies in Great Britain, and to attempt to relate the results to pollutant concentration in eggs and tissues. Data on concentration of organochlorines and heavy metals in eggs and tissues collected from North American breeding sites are presented. Both DDE and dieldrin levels were lower than those found in many other seabirds, with DDE ranging from 0.4 to 12.0 ppm, and dieldrin from 0.02 to 0.35 ppm. However, PCB, Hg and Cd levels were all high. Breeding success was determined by examining nests at 3-day intervals until hatching, and opening any unhatched eggs. It is noted that no control data exist with which to compare current breeding statistics. Closely related populations of Skua breeding in the Antarctic and sub-Antarctic, where pollution is detectable but slight, were studied to obtain baseline data. In addition, data on the breeding success of a variety of seabird species not apparently affected by pollution was examined to provide a second baseline. An average of 17.7% of the Great Skua eggs studied survived through incubation, but failed to hatch. An average of 3.2% of the chicks that began to hatch died before emerging. Of the chicks that hatched, 0.42% were grossly abnormal. Eggs that failed to hatch were opened; 12% were found to be infertile when laid and 6% suffered embryo death prior to hatching. Comparison with data from other sea birds shows that the Great Skuas produced twice as many addled eggs, and 8 times as many deaths at hatching. The data are discussed in relation to known effects of PCBs and heavy metals on breeding. The main sublethal effect of PCBs is on reduction of egg hatchability. Mercury can cause embryonic death and can disturb cell division, resulting in reduced fertility. The evidence suggests that the pollutants contribute to infertility and low viability of embryos, and further studies are recommended.

80-2472. Baldi, M.; Bovolenta, A.; Zanoni, L. (Lab. Prov. Ferrara, Cent. Prev. Intossicaz. Fitofarm., Ferrara, Italy) **La contaminazione degli alimenti da pesticidi clorurati e fosforati: due anni di ricerche (1977-1978) su alimenti prodotti nella provincia di Ferrara. [Food contamination with chlorinated and phosphoric pesticides - 2 years research (1977-1978) on foods produced in Province of Ferrara.]** *Ind. Aliment. (Pinerolo, Italy)* 18(11): 806-810; 1979 (1 reference) (Italian).

Studies on pesticide contamination of foods from the province of Ferrara in Italy on apples, pears, vegetables, grains, whole milk and game were started in 1974 and continued in 1977-78. Concentrations of the more important organophosphate pesticides (diazinon, methyl parathion and parathion) between 1 and 100 ppb were frequently encountered in 1977. A few apple and pear samples contained organophosphates at more than 100 ppb. In 1978, the levels of commonly used pesticides decreased, but an increase was observed in residues of azinphos-methyl and phosalone. Organophosphate contamination was apparently due to misuse of pesticides or failure to observe withholding times. Considerable organochlorine contamination was found in 1977. It was presumed that old stocks of organochlorines were still being used. An apparent decreasing trend for organochlorine concentration was found in 1978. Game contained the highest organochlorine levels in both years tested, including some levels in excess of 1000 ppb.

80-2473. Fox, G. A. (Wildl. Toxicol. Div., Canadian Wild. Serv., Natl. Wildl. Res. Cent., Ottawa, Ontario K1A OE7, Canada) **Simple method of predicting DDE contamination and reproductive success of populations of DDE-sensitive species.** *J. Appl. Ecol.* 16(3): 737-741; 1979 (13 references).

A simple method predicting DDE contamination and reproductive success of DDE-sensitive populations of merlin *(Falco columbarius)* is presented. The Ratcliffe thickness indices and residue contents were determined for eggs from 110 nesting sites in Canada. Nesting success was noted, as well as the percentage of eggs producing young of bandable age. A model was then developed to predict the DDE content and reproductive success of the same population for 3 consecutive yr. The model accurately predicted nesting success and DDE content within 20%. The model is useful in areas where reproductive success is constrained by DDE, but was demonstrated on populations of at least three subspecies in different locations. This model will be of use in managing and monitoring endangered species or heavily contaminated populations.

80-2474. Schreck, C. E.; Carlson, D. A.; Weidhaas, D. E.; Posey, K.; Smith, D. (Insects Affecting Man & Anim. Res. Lab., Agric. Res., SEA, USDA, Gainesville, FL 32604) **Wear and aging tests with permethrin-treated cotton-polyester fabric.** *J. Econ. Entomol.* 73(3): 451-453; 1980 (5 references).

Gas chromatographic analysis of cloth patches treated with permethrin (0.125 mg/cm²) and worn by test subjects showed that 24-48% of the chemical remained after 10-30 days of wearing. Only a few minor degradation products were detected. However, bioassay of these patches against *Aedes aegypti* (L.) and *Anopheles quadrimaculatus* Say showed that knockdown time of the worn patches was *ca.* 5-fold longer than that for unworn patches after 30 days. Both the chemical and biological assays indicated that the greatest loss of permethrin from the patches occurred within the 1st 10 days. Aging without wearing did not appreciably reduce the amount of permethrin in the patches during the 30 days of the test. (Author abstract by permission)

80-2475. Reish, D. J.; Geesey, G. G.; Kauwling, T. J.; Wilkes, F. G.; Mearns, A. J.; Rossi, S. S. (California State

Univ., Long Beach, CA) **Marine and estuarine pollution.** *J. Water Pollut. Control Fed.* 52(6): 1533-1575; 1980 (485 references).

A literature review of marine and estuarine pollution is presented. Major topics covered include pesticides, microbiology, residues, complex effluents, disease and pathology, dredging, dumping, wastewater sludge, and oil pollution. The acute toxicological effects of the pesticides carbaryl, DDT, diazinon, diflubenzuron, dimethoate, EPN and leptophos are presented in tabular form. Toxicity varies considerably with pesticide and organism tested. The fish *Therapon jarbua* has an LC50 of 3600 μg/l for DDT and 700 μg/l for dimethoate. EPN has an LC50 of 0.29 μg/l for the decapod *Penaeus duorarum* and 188.9 μg/l for the fish *Cyprinodon variegatus.* A series of studies on the sublethal effects of pesticides is also discussed. Residue level measurements in animal tissues for chlordane, chlorinated terpenes, DDT, DDD (TDE), DDE, dieldrin, endosulfan, Kepone (chlordecone) and lindane are given. Discussions on the microbiology of pollution include bacterial diseases and the microbial degradation of many classes of pollutants. Several studies relating pollutants to diseases in marine animals are discussed. Tumors, stress, and physiological and histological changes are reported to be caused by many classes of pollutants.

80-2476. Solianova, E. M.; Bakhramov, S. (All-Union Res. Inst. Cotton Growing, Andizhan, USSR) **Gerbitsidy v khlopkovo-liutsernovom sevooborote. [Herbicides in cotton-alfalfa crop rotation.]** *Khim. Sel'sk. Khoz.* 18(4): 45-46; 1980 (Russian).

The effect of herbicides prometryne (1.5 and 1 kg/ha), Cotoran (fluometuron; 1 kg/ha), and Treflan (trifluralin; 1 and 2 kg/ha) was studied in a cotton-alfalfa crop rotation. Herbicides were applied for 6 yr. After band application of Kotoran at 1 kg/ha and Treflan at 2 kg/ha, and solid application of Treflan at 1 kg/ha, soil did not contain herbicide residues. After prolonged (4 yr) applications of Kotoran at 2 kg/ha, soil contained 0.03-0.06 mg/kg of herbicides. Further accumulation of herbicide is suggested to be undesirable.

80-2477. So, C. L. (Dep. Geogr. & Geol., Univ. Hong Kong, Hong Kong) **Mercury-water interactions in the estuarine environment.** *Mar. Pollut. Bull.* 10(11): 334-337; 1979 (26 references).

Studies of estuarine water-mercury interactions indicate that local mercury levels in estuarine waters reflect the effect of external forces on the estuary. The interactions of soluble and insoluble water components and heavy metals play an important part in metal transport in and out of the estuary, and eventually affect biotic portions of the ecosystem. The process of methylation of mercury in aquatic environments is considered in relation to the spatial and temporal mobilization of mercury. The tendency for mercury to concentrate or disperse in the estuarine environment due to water-mercury interactions is an essential factor to monitor when designing an environmental management program for this heavy metal.

80-2478. Jenkins, S. H. (Author address not given) **Coastal pollution of the Mediterranean.** *Mar. Pollut. Bull.* 11(1): 6-10; 1980.

An overview of the coastal pollution of the waters of the Mediterranean Sea is presented. In 1979 a conference was held in Spain on the scientific and technical aspects of the pollution of the Mediterranean. It was recognized that the most significant pollution sources of the Mediterranean Sea had their origin on the land. Rivers carrying sewage wastes from industrial, domestic and agricultural activities seemed to be the major contributors to pollution of the sea. The four main areas that pollution of the Mediterranean affected were public health, aesthetics, sediments, and the marine environment. Bacterial pollution due to sewage was observed as the biggest threat to human health. Eutrophication is regarded as an important problem due to its interference with tourism and fishing. Analyses of heavy metals such as Zn, Cd, Pb and Hg in sediments have proven useful for monitoring coastal pollution of the sea. The possible beneficial effects of treating sewage and ballast water before release into the sea are discussed. The sanitation measures that have been taken to improve the seawater quality for bathing are also examined.

80-2479. Tuncel, G.; Ramelow, G.; Balkas, T. I. (Dep. Chem., Middle East Tech. Univ., Ankara, Turkey) **Mercury in water, organisms and sediments from a section of the Turkish Mediterranean coast.** *Mar. Pollut. Bull.* 11(1): 18-21; 1980 (9 references).

Three sites along the Turkish Mediterranean coast were sampled for mercury levels in seawater, sediment and marine life. Preservative solutions were added to water samples immediately after collection and concentration procedures were used before analysis by cold-vapor atomic absorption spectrometry (AAS). The loss of mercury from seawater samples during storage was also studied in 25 *l* samples. Different preservatives were added to 4 groups of 5 from these 25 samples, and they were analyzed for mercury content after 6 mo. The remaining 5 samples containing no preservatives were analyzed after 24 hr. Muscle tissue preparations from the organisms collected were analyzed for mercury residues by cold-vapor AAS. Sediment samples were frozen immediately upon collection, and later thawed, digested, and diluted before analysis for mercury in the region of the Mediterranean studied are generally low. Experiments on mercury preservatives in seawater showed that no preservative was 100% effective, but the best results were obtained with a HNO_2-$K_2Cr_2O_7$ solution. This preservative allowed only a 20% loss of mercury from seawater over a 6 mo period. HNO_3 was found to be adequate for extracting mercury from marine sediments. Other studies showed that the amount of mer-

cury extracted form sediments is affected by the length of the digestion period. Mercury levels in all sediment samples were low, except in those taken from Mersin Harbor, where shipping activities might be more extensive.

80-2480. Wright, C. G.; Leidy, R. B. (North Carolina State Univ., Raleigh, NC) **Air samples in vehicles and buildings turn up only very low levels of organic phosphate insecticides.** *Pest Control* 48(7): 22-68; 1980 (5 references).

Air samples were taken from office and insecticide storage rooms in commercial pest control buildings, food preparation and serving areas, and vehicles used daily by commercial pest control firm technicians. Chlorpyrifos, diazinon, malathion and DDVP (dichlorvos) were present in the storage rooms. Ambient air of the office rooms contained significantly less insecticide than the insecticide storage rooms, with the exception of malathion. One newly-constructed office building with central air-conditioning had a high level of insecticide in the office area due to direct connections with the storage area through the air conditioning system. In the food preparation and serving areas chlorpyrifos was sprayed to control cockroaches. The chemical was found in all ambient air samples taken. More chlorpyrifos was found in the ambient air of the cabs of pest control vehicles when the compressed-air sprayers were kept in the cabs of the pickups that when the sprayers were kept in the bed of the pickup. The insecticide levels detected in the buildings and vehicles were below allowable limits.

80-2481. Narayan, K. G.; Varma, R. K. (Dep. Vet. Public Health, Rajendra Agric. Univ., Bihar, India) **Animals as indicators of environmental pollution with pesticides.** *Pesticides* 14(2): 3-6; 1980 (11 references).

The use of animals to monitor environmental pollution by pesticides may be achieved by direct measurement of the pollutant in the abiotic community or by the use of biological indices such as bioassays or measurements of total community indicators. Measurement of the amount of pesticide present in the abiotic environment or in plants is not always a clear indication of the extent of pesticide uptake by animals or humans. Accidental exposure of non-target organisms to pesticides in natural habitats often yields better information on the effects of pesticides than do laboratory studies. Trophic accumulation of pesticides may be observed in nature, an important factor that is often eliminated in laboratory studies. Birds are preferred over mammals when selecting a species for assessing widespread effects of a pesticide due to their migratory nature because a larger area may be monitored. The parameters that are considered when estimating the effects of a pesticide on a terrestrial bird population are: direct bird mortality, egg shell thickness, reproductive success, pesticide residue levels in eggs, and variations in the number of eggs layed or in the quality of offspring. To study aquatic pollution by pesticides fish mortality, fish pesticide residue levels and fish behavior patterns are examined. Dieldrin and BHC residues in trout are considered as examples of indicators of possible sheep dip mortalities.

80-2482. Singh, K. N.; Srivastava, B. P. (Dep. Food, Gov. India Indian Grain PAU Campus, Storage Inst., Ludhiana 141004, India) **Studies on the efficacy and extent of residues of phosphine in stored pulses.** *Pesticides* 14(2): 32; 1980.

To examine the efficacy and safety of phosphine (aluminum phosphide) gas fumigation of stored grains in India, toxicity tests were conducted on 2 species of pulse beetles (*Collosobruchus maculstus* Fab. and *Callosobruchus chinensis* L.) and 3 pulses (*moong*, cowpea, and pea). Four other fumigants were used as a basis for comparison in the toxicity tests. The order of relative toxicity to the pulse beetles was found for both species to be phosphine > ethylene dibromide > carbon disulfide > ED/CT mixture (ethylene dichloride) > carbon tetrachloride. Phosphine residues in fumigated *moong*, cowpea, and pea were below tolerance limits of 0.01 ppm after 1.63, 2.19 and 2.51 days of aeration, respectively. Even exaggerated doses of the fumigant failed to produce residue levels above the tolerance limits after a 0.5 min washing. Phosphine gas was found to uniformly penetrate the grain mass within 96 to 120 hr provided the storage structure was airtight. Sorption studies indicated that 1 tablet/ton would provide adequate treatment of the grain. From these findings it was concluded that phosphine fumigation could be adopted for safe and effective treatment of pulse beetles provided the grain was washed before consumption.

80-2483. Quirijns, J. K.; Van der Paauw, C. G.; ten Noever de Brauw, M. C.; de Vos, R. H. (Cent. Inst. Nutr. & Food Res., TNO, Zeist, The Netherlands) **Survey of the contamination of Dutch coastal waters by chlorinated hydrocarbons, including the occurrence of methylthiopentachlorobenzene and di-(methylthio)-tetrachlorobenzene.** *Sci. Total Environ.* 13(3): 225-234; 1979 (15 references).

A 1976 study on contamination of Dutch coastal waters by organochlorine compounds is described. At least 25 mussels (*Mytilus edulis*) were collected at each of 14 sampling sites. After removal of the shells, the contents were homogenized and extracted with hexane. The samples were analyzed by gas-liquid chromatography, by gas-liquid chromatography with mass spectrometry, and by nuclear magnetic resonance spectrometry. HCB (hexachlorobenzene) ranging from 0.001 to 0.16 mg/kg; dieldrin, 0.10 mg/kg; endrin, 0.003 to 0.013 mg/kg; *p,p'*-DDT, 0.003 to 0.005 mg/kg; *p,p'*-TDE, 0.003 to 0.008 mg/kg; PCBs, 0.10 to 0.65 mg/kg; and γ-HCH (lindane), 0.005 mg/kg were detected. In addition, two compounds previously unknown in the aquatic fauna were isolated and identified as methylthiopentachlorobenzene

and 1,4-di(methylthio) -2,3,5,6-tetrachlorobenzene. Their concentrations ranged from 0.005 to 0.40 mg/kg. Further work is required to determine the origin of these compounds. The possibility of their presence in technical quintozene or being metabolites of quintozene is discussed.

80-2484. O'Shea, T. J.; Fleming, W. J., III; Cromartie, E. (Gainesville Field Stn., Natl. Fish & Wildl. Lab., Gainesville, FL 32601) **DDT contamination at Wheeler National Wildlife Refuge.** *Science* 209(4455): 509-510; 1980 (16 references).

Disposal of industrial waste resulted in massive DDT contamination at Wheeler National Wildlife Refuge, Alabama. Nearly a decade after the cessation of DDT manufacturing at the facility responsible, concentrations of DDT residues in the local fauna are still high enough to suggest avian reproductive impairment and mortality. Populations of fish-eating birds are low, endangered species are being exposed, and muscle lipids of game birds contain up to 6900 parts of DDT (isomers and metabolites) per million. (Author abstract by permission. Copyright 1980 by the American Association for the Advancement of Science.)

80-2485. Ohisa, N.; Yamaguchi, M. (Dep. Agric. Chem., Univ. Osaka Prefect., Sakai, Osaka 591, Japan) ***Clostridium* species and γ-BHC degradation in paddy soil.** *Soil Biol. Biochem.* 11(6): 645-649; 1979 (27 references).

Studies suggest that BHC degradation in paddy soil is principally a function of the action of anaerobic *Clostridium* spp. BHC was added to cultures of the bacteria in an alcohol solution and later extracted with *n*-hexane to determine the concentration changes during the course of the experiment. BHC decomposers were counted using the most probable number (MPN) method. O_2 inhibited growth of the bacteria and therefore the degradation of BHC. The addition of other soil microorganisms and bentonite clay reduced the inhibition. The half-life of γ-BHC (lindane) in submerged systems was shown to be a function of the numbers of anaerobic γ-BHC decomposers and the amounts of ninhydrin-positive materials in the soil. The addition of peptone to culture media increased the growth of α-BHC decomposers from 10^1 to 10^6/g and α-BHC decomposers from 10^4 to 10^7/g. It was demonstrated that many species of *Clostridium* could decompose γ-BHC but none of those tested could decompose β- or δ-BHC.

80-2486. Smith, W. H.; Haefele, D. M. (Sch. For. & Environ. Stud., Yale Univ., New Haven, CT 06511) **Carbendazim exudation from roots of American elm.** *Soil Biol. Biochem.* 11(6): 687-688; 1979 (18 references).

Carbendazim was observed in the root exudates of trees previously pressure injected with the systemic fungicide carbendazimphosphate. American elm seedlings received 1.0 and 2.0 g AI/cm diameter. Root exudates were collected at 48-65 hr, 24 days and 89 days after injection, and the presence of carbendazim was determined by thin layer chromatography. The rates of appearance of the fungicide in root exudates varied, but all injected trees eventually tested positive. A variety of phytotoxic symptoms appeared after 3 days, but none persisted beyond 4 wk. Symptoms included wilt, defoliation and scorch. Further research should be conducted to quantify release rates and the effects on important rhizosphere organisms.

80-2487. Bollag, J. M; Liu, S. Y.; Minard, R. D. (Dep. Agron., Pennsylvania State Univ., University Park, PA 16802) **Cross coupling of phenolic humus constituents and 2,4-dichlorophenol.** *Soil Sci. Soc. Am. J.* 44(1): 52-56; 1980 (14 references).

Various phenolic compounds occurring in soil can be incorporated into humus complexes by microbial activity. In this study experiments were carried out in which a phenoloxidase isolated from the fungus *Rhizoctonia praticola* was incubated with humus constituents such as orcinol, syringic acid, vanillic acid, and vanillin individually and in the presence of 2,4-dichlorophenol. Oligomeric products, dimers to pentamers, were formed by oxidative coupling as determined by mass spectrometry. The combined incubation of naturally occurring phenols and 2,4-dichlorophenol, a main product of various herbicides, resulted in the formation of cross-coupling products. The occurrence of such processes in soil may lead to the incorporation of xenobiotic compounds into soil organic matter by enzymatic activity, and thus prolong their persistence in soil. (Author abstract by permission)

80-2488. Jury, W. A.; Grover, R.; Spencer, W. F.; Farmer, W. J. (Dep. Soil & Environ. Sci., Univ. California, Riverside, CA 92521) **Modeling vapor losses of soil-incorporated triallate.** *Soil Sci. Soc. Am. J.* 44(3): 445-450; 1980 (15 references).

Vapor losses of triallate [*S*-(2,3,3-trichloroallyl) diisopropylthiocarbamate] incorporated into 2 soils with widely different organic matter contents were measured in the absence and presence of evaporating water. Adsorption isotherms (relating triallate solution concentrations to adsorbed triallate) were used to compare predicted and measured transport of triallate by mass flow and diffusion. With San Joaquin sandy loam, volatilization rate was greater when water was evaporating than when evaporation was suppressed but with Flanagan silt loam packed to a mucher lower bulk density, vapor loss was nearly the same in the presence and absence of evaporation. Total vapor losses during the 29- or 30-day period were 2.97 and 3.76% of the amounts applied from San Joaquin sandy loam and 3.72 and 3.80% from Flanagan silt loam without and with evaporation, respectively. Good agreement was observed between the total measured triallate vapor flux with

evaporation and the convective mass flux calculated from the product of the solution concentration below the surface times the water evaporation flux. (Author abstract by permission)

80-2489. Doran, J. W. (Univ. Nebraska, SEA-AR, USDA, Lincoln, NE 68583) **Microbial changes associated with residue management with reduced tillage.** *Soil Sci. Soc. Am. J.* 44(3): 518-524; 1980 (14 references).

The effects of corn residue on soil microbiological populations for dryland corn (*Zea mays* L.) production in Nebraska were closely related to placement of residue and soil water and pH regimes. Populations of bacteria, actinomycetes, and fungi increased 2- to 6-fold as a result of mulching. The response of fungi populations to residue application was limited by competition from bacteria and actinomycetes as related to changes in soil water content and pH regimes. Counts of nitrifying and denitrifying organisms in the surface soil increased 2- to 20-fold and 3- to 43-fold, respectively, in plots receiving surface applications of corn stover. The physical, chemical, and biological characteristics of the between-row area differed dramatically from those of the within-row area with the till-plant system. The soil-water content, microbial populations, soil pH, and soil nitrate content of the between-row area were significantly higher than those within-row. Many of these differences were associated with the distribution of residue, soil, and surface applications of lime. Under more uniform moisture and soil conditions in the greenhouse, surface application of corn stover resulted in 2- to 5-fold increases in microbial populations. The additional responses of microbial populations to residue in the field were related to increased soil water contents. In addition, residues influenced the microbial response to application of both lime and herbicides (atrazine and alachlor). The application of residue reduced the inhibitory effect of herbicides on nitrifying populations. The changes in microbial ecology associated with residue management should influence decisions for alternate residue-management and fertilizer practices with reduced tillage. (Author abstract by permission)

80-2490. Amonette, J.; O'Connor, G. A. (Agric. Exp. Stn., New Mexico State Univ., Las Cruces, NM 88003) **Nonionic surfactant effects on adsorption and degradation of 2,4-D.** *Soil Sci. Soc. Am. J.* 44(3): 540-544; 1980 (29 references).

The effects of 3 nonionic surfactants on 2,4-D (2,4-dichlorophenoxyacetic acid) adsorption and degradation was determined for 2 soils in laboratory studies. The surfactants varied in water solubilities and hydrophilic-lipophilic balance (HLB) values. Adsorption of 2,4-D was significantly decreased in both soils by the least water-soluble surfactant, X-35. Degradation of 2,4-D was also significantly delayed by X-35 to various extents in both soils. However, extent of degradation was independent of treatments after 70 days. Various hypotheses, based on surfactant properties, are offered to explain the adsorption and degradation results. When surfactant concentrations remain above the critical micelle concentration, nonionic surfactants with low HLB values can significantly alter 2,4-D behavior in soil. Surfactants with high HLB values appear to have little effect on 2,4-D behavior. (Author abstract by permission)

80-2491. Colosi-Esca, D.; Nadejde, M. (Inst. Hyg. & Public Health, Cluj, Rumania) **The content of dimethoate in the atmosphere of AN-2 agricultural aircraft cockpits during applications.** *Toxicol. Lett.* 5(Sp 1): 136; 1980.

Aircraft have become very useful in the application of ULV-insecticides to agricultural crops. AN-2 aircraft cockpits were sampled for their atmospheric content of dimethoate from Dimevur 1 before loading, at 5, 10, and 20 min of ULV spraying, and after landing and stopping the aircraft motor. Laboratory analyses of the air samples indicated a need to reduce the allowable level of malathion from 15 mg/m^3 air to 10 mg/m^3 air. For dimethoate, it was suggested that a maximum allowable concentration of 10 mg/m^3 air be adopted. [Abstract P.23 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2492. Joiris, C.; Delbeke, K. (Lab. Ekol. Systematiek, Vrije Univ. Brussels, B-1050 Brussels, Belgium) **Ecotoxicological mechanisms of organochlorine pesticides and PCBs mechanisms in Belgian terrestrial ecosystems.** *Toxicol. Lett.* 5(Sp 1): 143; 1980.

A 10 yr study (1969-1979) of DDT contamination of twelve species of Belgian birds of prey was conducted. The number of unhatched eggs and dead raptors, and the changes in eggshell thickness were examined. Coherent results were obtained on all three parameters and DDT contamination was found to be species dependent. Geographical and annual variations were also noted in some species such as owls. It was suggested that the more birds raptors eat, the higher their level of DDT contamination. This hypothesis was confirmed by analyses of DDT residues in some prey items such as sparrows and small mammals. [Abstract P.36 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2493. Helweg, A. (Lab. Environ. Sci. & Ecol., Tech. Univ., DK-2800 Lyngby, Denmark) **Influence of temperature, humidity and inoculation on the degradation of ^{14}C-labeled 2-aminobenzimidazole in soil.** *Water Air Soil Pollut.* 12(3): 275-281; 1979 (13 references).

The evolution of carbon into carbon dioxide was used to measure degradation of ^{14}C-labeled 2-aminobenzimidazole in sandy loam soils. A temperature gradient incubator was used to determine the correlation between soil

temperature and degradation of the chemical for temperatures between 1 and 20°C. ^{14}C evolution was exponentially related to the inverse of the absolute temperature, in accordance with the Arrhenius equation. Between 25 and 35°C the evolution of ^{14}C was almost constant, at 22°C evolution it was maximum and it was almost nothing at 40°C. Air dry soil with water content varying from 28 to 277% of field capacity was used to study the correlation of water content in the soil to the degradation of the chemical. An exponential increase in carbon evolution was noted when water was 28-94% of the field capacity; ^{14}C evolution slightly decreased in soil when water content was above this level. When soil was inoculated with liquid aliquots from a soil perfusion apparatus, through which the chemical had been percolating for 6 mo, degradation of 2-aminobenzimidazole was greatly enhanced.

80-2494. Ahnoff, M.; Josefsson, B.; Lunde, G.; Andersson, G. (Dep. Anal. Chem., Univ. Goeteborg, S-41296 Goeteborg, Sweden) **Monitoring of total amount of lipophilic organo chlorine compounds in a Swedish river.** *Water Res.* 13(12): 1233-1238; 1979 (12 references).

Problems with the organoleptic properties of the Gota River in Sweden have necessitated the monitoring of organic bound chlorine in water quality analyses. Previous studies have shown that PCB and DDT are present in fish from Gota River waters in high amounts. PCB has been identified in the river water itself, but no specific point sources for this pollutant have been found. To detect such organic pollutants with harmful properties, the amount of organic bound chlorine which was extractable by cyclohexane was determined by neutron activation analysis. Results of 216 samples collected at 7 stations along the Gota River indicate that water entering from Lake Vanern had a consistantly low level of chlorinated lipophilic substances. Variations in the amount of chlorinated lipophilic wastes were found at the other sampling stations showing the effects of local industries along the river. The extraction efficiency of the method used was better than 80% for dissolved lipophilic compounds with large distribution constants. The detection limit was below 0.05 μg Ci/l.

See also 80-2402, 80-2403, 80-2417, 80-2428, 80-2430, 80-2442, 80-2443, 80-2448, 80-2449, 80-2452, 80-2501, 80-2507, 80-2508, 80-2512, 80-2515, 80-2520, 80-2527, 80-2532, 80-2554 *and* 80-2699.

80-2495. Weiss, A. H. (Dep. Chem. Eng., Worcester Polytech. Inst., Worcester, MA) **Pulse microreactor pesticides hydrodechlorination.** *Acta Chim. Acad. Sci. Hung.* 103(2): 111-121; 1980 (18 references).

A pulse microreactor was used to study the catalytic hydrodechlorination of chlorinated pesticides (DDT, DDE, TDE and aldrin) and other environmental pollutants (PCBs) into lower chlorine content compounds. Catalytic removal of chlorine is possible with subsequent replacement by hydrogen, producing partially chlorinated intermediates or completely dechlorinated hydrocarbons. The intermediates obtained were similar to some natural degradation products.

80-2496. Armstrong, W. A., Jr.; Driever, C. W.; Hays, R. L. (VA Hosp., Albuquerque, NM) **Analysis of drug-drug interactions in a geriatric population.** *Am. J. Hosp. Pharm.* 37(3): 385-387; 1980 (11 references).

Pharmacy records of 11,173 geriatric patients were reviewed for evidence of drug-drug interactions. The computer screening program detected 446 potential drug interactions that have been identified as clinically significant by the American Pharmaceutical Association's *Evaluations of Drug Interactions.* Of these, 362 (involving 298 patients) had sufficient data to be included in the study. The interactions were ranked according to their frequency of occurrence. It was noted that 22 potential interactions appeared 4 or more times, and constituted 85% of the 362 potential interactions. Phenobarbitol/warfarin, thyroid/warfarin, and phenytoin/warfarin interactions occurred 5 times, and aspirin/warfarin interactions occurred 4 times. It is suggested that with many interactions, the full effect of at least one of the agents may not have been produced, or the action may have been increased. The practical uses for this computer program are also discussed.

80-2497. Oller, W. L.; Cairns, T.; Bowman, M. C.; Fishbein, L. (Div. Chem., FDA-NCTR, Jefferson, AR 72079) **A toxicological risk assessment procedure: a proposal for a surveillance index for hazardous chemicals.** *Arch. Environ. Contam. Toxicol.* 9(4): 483-490; 1980 (7 references).

Health-oriented government agencies responsible for the protection of the public from possible adverse effects, such as that posed by chemical residues in the food supply, must establish priorities on regulatory action as well as for manpower to conduct monitoring programs. A new procedure entitled Surveillance Index (SI) is presented as a technique to evaluate toxic materials that are potential candidates as residues in food supplies and to assign an index number that identifies a relative hazard to the public among the various residues. The SI numbers can be used as criteria by which chemical residues should be monitored whenever conditions such as time and available resources are limiting factors. SI values for toxaphene, 2,4,5-T, *p,p'*-DDT, methyl parathion, carbaryl and aminotriazole (amitrole) are presented. (Author abstract by permission, modified)

80-2498. Avila, R. (Serv. Doencas Pulm., Fac. Med. Lisboa, Hosp. Santa Maria, Lisbon, Portugal) **Epidemiologic aspects of suberosis and vineyard's sprayers lung.** *Bronchopneumologie* 30(1): 50-60; 1980 (7 references).

Two epidemiological studies on respiratory disease in workers are described. In the first study the relationship of worker-exposure to cork dust and the occurrence of suberosis was studied. In the second study vineyard workers exposed to various pesticides, especially fungicides, were examined. The anatomo-clinical forms of vineyard sprayer's lung (VSL) are described, along with some epidemiological studies. The autopsy records of 4100 rural Portuguese workers with pulmonary pathology were reviewed; 832 (20%) cases of VSL were found. Other organs besides the lung were found to show copper-containing lesions. In a clinical study of 33 cases of VSL, 7 cases of lung cancer (21%) were found. A separate study showed that the incidence of adenocarcinomas and their alveolar-cell variety were considerably higher in patients with VSL.

80-2499. Villar, T. G.; Nogueira, T. (Serv. Doencas Pulm., Fac. Med. Lisboa, Hosp. Santa Maria, Lisbon, Portugal) **Radiology and respiratory function in vineyard sprayer's lung.** *Bronchopneumologie* 30(1): 61-67; 1980 (3 references).

A study of 33 Portuguese vineyard workers with vineyard sprayer's lung (VSL) is described. VSL is caused by copper containing pesticides. It is a granulomatous disease mainly involving the upper respiratory tract and the lungs, but also producing copper-containing lesions in the lymphatic system. Diagnosis is based on a history of pesticide exposure, the presence of lesions on chest radiographs, and some respiratory function patterns, but it must be confirmed by the presence of granulomatous lesions containing copper. In this study an effort was made to systematize the radiologic patterns and to correlate them with the functional changes. Only 14% of the patients had normal spirometry, with no obstructive ventilatory syndrome in 9%, restrictive changes in 48%, and ventilatory changes in 29% of the cases. Pleural pathology occurred in 11 cases. Lung cancer was found in 7 (21%) of the patients. It is concluded that there is a poor correlation between radiological patterns of the disease and lung function.

80-2500. Wicker, G. W.; Guthrie, F. E. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) **Worker crop contact analysis as a means of evaluating reentry hazards.** *Bull. Environ. Contam. Toxicol.* 24(1): 161-167; 1980 (13 references).

Reentry hazards of pesticides were assessed by filming farm workers harvesting crops and analyzing the worker-crop contact time. Five workers were filmed in normal work activity for 5 consecutive, 3.5 min intervals. Total time of contact between specific anatomic regions and the crop were recorded for tobacco, cotton, peach, blueberry and sweet corn. Work rates were assessed for tobacco, cotton and sweet corn. The percentage of workers wearing different items of clothing was calculated and, based on body part contact with various plants, specific clothing items were recommended for specific crop harvesting. Long pants were recommended for cotton scouts. Long sleeve shirts and gloves were suggested for tobacco harvesters and peach thinners. Gloves were recommended for sweet corn packers. Analysis of times of exposure of each anatomic region to crops allowed hazard assessment. Work-crop contact was highest for the hands. Pesticide absorption through the skin varies with anatomic region. The palms allow 1.3 fold greater penetration than forearms; exposure to hands is concluded to pose a greater work hazard. It is difficult to generalize over-all hazards because of complicating factors such as clothing differences, frequency of crop treatment and innate dermal toxicity of pesticides.

80-2501. Chasis, S. (Nat. Res. Def. Counc., New York, NY) **Problems and prospects of coastal zone management: an environmental viewpoint.** *Coastal Zone Manage. J.* 6(4): 273-280; 1979 (4 references).

A discussion of the federal Coastal Zone Management Act (CZMA) of 1972 is presented. It is argued that although in some states new laws have been adopted and funds have been provided, in general the program has not lived up to its promise. The need for an effective coastal program is discussed. Future development and expanded use of the coast is stressed. Some deficiencies in the state coastal zone management programs are mentioned, including lack of specificity in policies, absence of protection for key coastal resources, and lack of environmental control of agriculture, silviculture, residential housing, and highways. It is urged that the CZMA be strengthened, and several policy suggestions are presented.

80-2502. Matsushita, T.; Nomura, S.; Wakatsuki, T. (Dep. Hyg., Kagoshima Univ., Kagoshima, Japan) **Epidemiology of contact dermatitis from pesticides in Japan.** *Contact Dermatitis* 6(4): 255-259; 1980 (8 references).

An epidemiological study of 216 patients with contact dermatitis from pesticides is described. The study was carried out in rural areas of Japan in 1968-70. The results were analyzed according to conditions of use, sex, age, occupation, exposure and season. The cases consisted of 118 males and 98 females, with the majority 30-69-yr-old. All except 3 were farmers. In 78% of the cases exposure was by spraying. Most patients (96.6%) developed dermatitis from April to September, which correlates with the frequency of pesticide spraying in the areas. The pesticides most often responsible were captafol (Difolatan, 28.7%), dithiocarbamate fungicides (18.5%), highly and moderately toxic organic phosphates (18.1%), and chlorinated hydrocarbons (9.7%). It was found that lack of user protection was largely responsible for the dermatitis.

80-2503. Kraybill, H. F. (Natl. Cancer Inst., Bethesda, MD 20014) **By appropriate methods: the Delaney Clause.** *Ecotoxicol. Environ. Qual.* (2): 61-82; 1979 (26 references).

Various factors which must be considered in determining carcinogenicity on a particular chemical are discussed. These factors are concerned with identification, characterization and interpretation of data which result from laboratory tests. The extrapolation of data from experimentation on animals to possible human carcinogenic hazard is discussed with emphasis on statistical approaches, reproducibility of findings, confirmation of pathological diagnoses, the prevalence of dose-response relationships, tumor-to-tumor incidence data, experimental dose ranges within probable ranges of actual exposure and species and strain variations. Controversial factors discussed include inappropriate routes of administration, use of improper test species and strains, the role of diet, contaminants present in the test chemicals, body retention of lipophilic chemicals such as DDT and PCB, metabolic overload, immunosuppression and hormonal factors. In the discussion of metabolic overloading comparison of starting and final test levels of several pesticides (chlorinated hydrocarbon insecticides, organophosphate insecticides, the fungicides captan and Daconil (chlorthalonil), and the herbicides Amiben (chloramben and picloram) is presented in tabular form.

80-2504. Anonymous **Panel to discuss the epidemiology of 2,4,5-T, New York City, July 10-11, 1979.** *Ecotoxicol. Environ. Saf.* 4(1): 96; 1980 (19 references).

This panel report reviews the methods and data used by the US EPA to support the suspension of 2,4,5-T use. The possibility that the herbicide caused spontaneous abortion rates to increase in the Alsea basin area of Oregon after use of the chemical was the major reason for the suspension. Descriptions and criticisms of both the Alsea I and Alsea II reports are given. The comparability of the control and study areas, the determination of the true spontaneous abortion index, the actual individual exposure to 2,4,5-T and the presence of other chemicals in the area are considered and the conclusions of the original studies are reexamined. Recommendations for making both studies more informative through reanalysis of the data and the gathering of additional data are offered. There is a need for a comparative study in another area where 2,4,5-T is used, according to the panel. A definitive study outline is given to be used in the proposed comparative study to

determine whether 2,4,5-T is responsible for spontaneous abortions.

80-2505. Doutt, R. L. (Univ. California, Berkeley, CA) **Debugging the pesticide law.** *Environment* 21(10): 32-35; 1979 (8 references).

Problems with the US EPA's handling of pesticide legislation are discussed. It is pointed out that the EPA was given the difficult tasks of re-registering all pesticide products and formulating a national plan for monitoring pesticides in air, soil, man, plants and animals, with limited funds and technical personnel, and within time constraints (FIFRA). The result has been legislation that does not favor the American citizen. Questionable data has been used in some of the investigations, and the statutes appear to be one-sided, with no provisions for citizen participation in pesticide registration. The process for de-registering a pesticide is described, and is shown to be lengthy, complex, and favoring the pesticide producers. Several features that the author feels should be part of an acceptable law are discussed.

80-2506. Anonymous **Signal words: your guide to determining pesticide toxicity.** *Fla. Grow. Rancher* 73(6): 22; 1980.

Every pesticide registered with the EPA must bear one of the words caution, warning or danger-poison on the product label. These words correspond to the pesticides rank in four toxicity categories: category I - highly toxic, category II - moderately toxic, category III - slightly toxic, and category IV - relatively non-toxic. Categories are determined by effects of the pesticides when swallowed, inhaled, spilled on the skin or splashed in the eyes. The signal word caution is required on labels in category III and IV and generally informs the user of a low order of toxicity to mammals. Warning identifies pesticides in category II. Danger-poison identifies category I products, and the labels must also include special handling procedures and may have specific restrictions regarding sale and use of the product.

80-2507. Rexilius, L.; Schmidt, H. (Schleswig-Holstein Plant Prot. Off., Kiel, BRD) **Decomposition behavior of herbicides on meadows and pastures.** *Gesunde Pflanz.* 31(6): 141-144; 1979.

Field experiments were conducted to determine whether the mandatory Federal Republic of Germany 21 day precautionary period between the application of various herbicides on meadows and pastureland to control chickweed *(Stellaria)* and the admission of cattle to pasture could be shortened. The herbicides tested were 2,4-D, MCPA, MCPB, and the combination 2,4-D + MCPA at recommended levels and double these levels; and mecoprop and the combination mecoprop + dinoseb preparations at levels of 6 and 12 *l*/ha. The herbicides were applied in the fall and spring, and their progressive decomposition was monitored at various intervals. The toxicologically maximum permissible level of the herbicides is 2 mg/kg green mass. The results of the experiments demonstrated that while none of the herbicides tested exceeded this level following the expiration of the 21 day precautionary period most did after only a 2 wk precautionary period.

80-2508. Anonymous **Dichlorodiphenyltrichloroethane (DDT).** *J. Am. Med. Assoc.* 244(1): 16; 1980.

A study on DDT exposure in a small Alabama community is described. The town is 8 km downstream from a chemical plant that was involved in the manufacture of DDT from 1947-1970. Examination of 499 of the 600 residents showed the average serum DDT level to be at least six fold higher than the United States average. DDT levels increased with age. Fish consumption was the second strongest determinant of DDT level. No general indices of ill health were correlated with DDT levels, but there was an increase in levels of serum triglycerides, cholesterol, and α-glutamyl transpeptidase associated with increasing DDT levels. It is noted that a subset of 43 serum samples showed a correlation between PCB and DDT levels, complicating interpretation of health effects.

80-2509. Deom, A.; Aeschlimann, J. M.; Aellig, A. (Cent. Lab. Clin. Chem., Hop. Cantonal Univ., CH-1211 Geneva 4, Switzerland) **Conversion scales for commonly requested serum concentrations of drugs and other substances of therapeutic and toxicological importance, and of hormones.** *Lancet* 1(8180): 1241-1244; 1980 (2 references).

Conversion scales to and from metric and molar SI (Systeme International d'Unites) units are presented for use as an aid to persons needing such information in cases of poisoning or overdose, or to monitor drug therapy. Conversion factors are provided for metals, hormones, drugs and other toxic agents (including the pesticide paraquat).

80-2510. Kuntz, H. D.; May, B. (Med. Universitaetsklin. & Poliklin., Abt. Gastroenterol. & Hepatol., Berufsgenossenschaftlichen Krankenanstalten, D-4630 Bochum 1, BRD) **Berufsbedingte Lebererkrankungen. [Occupational liver diseases.]** *Muench. Med. Wochenschr.* 122(29-30): 1059-1062; 1980 (17 references).

Many exogenous substances are found in the environment and in work places which are potentially toxic to the liver. Continuous supervision of exposed workers and strict adherence to safety provisions are stressed to avoid damage to the liver. Some hepatic toxins which may be encountered occupationally are the halogenated hydrocarbons, aromatic amines, TOCP, hydrazine, chromium, insecticides, vinyl chloride, and halothane. If exposure to

hepatotoxins is recognized in time and the causal agents are eliminated from the work area, the worker may get by with minimal liver damage. It is suggested that diagnostic and prophylactic measures be aimed at rehabilitation and adoption of specific occupational hygiene practices.

80-2511. Kiraly, J.; Szentesi, I.; Csorsz, K.; Czeizel, A. (Out-Patient Dep., Budapest Chem. Works, Budapest, Hungary) **Study on mutagenicity of pesticides in agricultural workers.** *Mutat. Res.* 74(3): 172-173; 1980.

A considerable, though transient increase of chromosome aberrations in persons suffering from severe acute intoxication and in industrial workers exposed to chronic low doses of organophosphate insecticides has been reported. In the epidemiological study a significant increase of fetal death was found in male workers and the occurrence of congenital malformations was significantly higher in the female workers. These epidemiological and cytogenetical studies were being continued in agricultural workers using these insecticides. This poster demonstrated the reproductive failures and the cytogenetic data of the agricultural workers. [Abstract 11 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2512. Anonymous **Drug therapy and the nursing mother.** *Patient Care* 14(12): 59-74, 79-83, 87, 91-94, 97-101, 105; 1980.

Certain drugs are contraindicated for use in nursing mothers. Drugs and chemicals, such as polyhalogenated biphenyls and chlorophenothane (DDT), may be excreted in breast milk and absorbed by the infant gastrointestinal tract. Warfarin for use as an anticoagulant may be used safely by nursing mothers but observation for any bleeding tendencies should be maintained. In a test series conducted on 13 women, this chemical did not appear in the breast milk. Use of DDT as a pediculocide or miticide is also contraindicated. This drug is toxic due to its very high lipid solubility. Breast milk may be the only elimination route. If there is doubt regarding the maternal body burden of DDT, PBBs and PCBs, the chemicals can be measured in the breast milk.

80-2513. McDonald, J. (Environ. Prevent. Med. Unit, US Navy, Norfolk, VA 23511) **How can we dispose of unused pesticides?** *Pest Control* 47(12): 36-37; 1979.

A short discussion of various methods for the disposal of unused pesticides is presented. Once the problems of collecting unwanted containers of pesticides are solved, decisions have to be made regarding storage or destruction of the pesticides. Burial at sea, in the ground or in trenches is deemed unacceptable, as is construction of expensive holding facilities or use of very deep wells for disposal. Temperatures of 900°C would be necessary to detoxify pesticides. The author proposes that the only means for disposing unwanted pesticides is to use them properly for the registered uses on the label.

80-2514. Axelson, O.; Sundell, L.; Andersson, K.; Edling, C.; Hogstedt, C.; Kling, H. (Dep. Occup. Med., Univ. Hosp., S-581 85 Linkoping, Sweden) **Herbicide exposure and tumor mortality. An updated epidemiologic investigation on Swedish railroad workers.** *Scand. J. Work Environ. Health* 6(1): 73-79; 1980 (14 references).

A 1974 epidemiologic study carried out on Swedish railroad workers exposed to herbicides was updated, with the cohort of 348 workers followed through October 1978. The major herbicides to which the workers were exposed were amitrole and phenoxy acids (2,4-D and 2,4,5-T). The expected numbers of total deaths and deaths from different tumors were calculated and compared with the observed numbers. Seventeen tumors were found compared with 11.85 expected. The excess mortality from tumors occurred particularly among persons with combined exposure to amitrole and phenoxy acids. Tumor mortality among persons exposed to amitrol was rather moderate. The earlier slight excess of tumor deaths among people exposed to phenoxy acids had become more pronounced. The authors suggest that although the aspects of causal relationships to specific agents remain unclear, the results do indicate a need for careful handling of amitrole and phenoxy acids.

80-2515. Drevenkar, V.; Frobe, Z.; Vasilic, Z.; Tkalcevic, B.; Stefanac, Z. (Inst. Med. Res. & Occup. Health, Yu-41001 Zagreb, Yugoslavia) **The rate of urinary excretion of phosalone residues in occupationally exposed persons.** *Sci. Total Environ.* 13(3): 235-244; 1979 (17 references).

Urine of workers occupationally exposed to malathion and phosalone was analyzed for excreted residues. The malathion residue, *O,O*-dimethyl phosphorodithioate potassium salt, was found in 8 of 14 urine samples, at levels of 449 to 1072 ng/ml urine. Levels of the phosalone residue, *O,O*-diethyl phosphorodithioate, in samples collected before work were equal to, or higher than, residues in samples collected after work, indicating that the excretion of phosalone metabolites was not complete until the beginning of the next working day. This conclusion was confirmed by studies in which a previously-unexposed volunteer was experimentally exposed to phosalone during one working day and then again on 3 subsequent days. The excretion of urinary phosalone metabolites was greatest 4-5 hr after exposure, but metabolites were still measurable in urine at the beginning of the next day. Blood and plasma cholinesterase activities were only slightly reduced during exposure. Suggestions for monitoring occupationally exposed persons are made based on the findings of the study.

80-2516. Kolmodin-Hedman, B.; Swensson, A.; Akerblom, M. (Div. Occup. Med., Univ. Hosp., S-750 14

Uppsala, Sweden) **Occupational exposure to some synthetic pyrethroids.** *Toxicol. Lett.* 5(Sp 1): 50; 1980.

The effects of fenvalerate and permethrin exposure were studied; 112 persons occupationally exposed to these insecticides were interviewed. Symptoms were reported by 73% of those handling fenvalerate and 33% of those handling permethrin. The major symptoms reported were skin and eye irritation. Respiratory symptoms and paresthesis occurred only in those using fenvalerate. Work is now being carried out on analyses for estimating exposure to permethrin in air and urine. [Abstract O.69 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2517. Rouzioux, J. M.; Belliato, R. (Lab. Med. Leg. & Toxicol. Med., Fac. Alexis Carrel, Lyon, France) **Frequency of death from poisoning.** *Toxicol. Lett.* 5(Sp 1): 150; 1980.

The results of 580 autopsies on deaths from intoxication are presented. The most frequent toxin reported was carbon monoxide (264 cases). Drugs were the cause of 278 deaths; 189 of them were barbituate related. Twenty six cases of death due to industrial chemicals were reported; with trichloroethylene being the most frequent. Only 12 deaths were attributed to agricultural chemicals. [Abstract P50 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2518. Carrington da Costa, R. B.; Maul, E. R.; Pimentel, J.; Goncalves, J. S.; Rebelo, A.; Oliveira, L.; Matos, D. (Intensive Care Unit, Coimbra Univ. Hosp., Coimbra, Portugal) **The present dangers of organophosphate insecticides in Portugal.** *Toxicol. Lett.* 5(Sp 1): 151; 1980.

An analysis of poisoning cases in Portugal is presented. All severe poisoning cases (90) handled by a particular hospital during the last 10 years were studied. Of the poisonings, 6.6% were occupational, 16.7% accidental, and 76.7% suicidal. It is noted that organophosphate insecticides are involved in a high number of suicides and that they are in the group of poisonings with the highest lethality rate. Sophisticated therapy with atropine, oximes, artificial ventilation and hemoperfusion has reduced mortality in recent years. Suggestions are made regarding improving advertising of the dangers of these products and legislation prohibiting easy access to these pesticides. [Abstract P.51 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2519. Peoples, S. A.; Maddy, K. T.; Peifer, W. R.; Edmiston, S. (Work. Health & Saf. Unit, Div. Pest Manage., California Dep. Food & Agric., Sacramento, CA 95814) **Occupational exposures to pesticides containing organoarsenicals in California.** *Vet. Hum. Toxicol.* 21(6): 417-421; 1979 (5 references).

Thirty-four cases of occupational exposure to organic arsenicals reported in California during the period 1975-77 were studied. There were 13 cases of eye irritation, 12 skin injuries, and 9 systemic disorders with symptoms that included nausea, vomiting, diarrhea, and abdominal pain. For each case, the condition of exposure, the herbicide involved, and the resulting symptoms and treatment are presented. No persistent problems were reported. Eye and skin injuries, in particular, were mild and responded well to treatment. It is suggested that proper maintenance and use of the application equipment could have prevented the injuries. A review of the literature shows no reports of acute or chronic toxicity involving man, and no reports that the organoarsenical compounds are carcinogenic or mutagenic.

80-2520. Anonymous **Government taking cooperative action to curb toxic pollutants.** *Vet. Hum. Toxicol.* 22(1): 37-40; 1980.

Information regarding the use and toxicity of various chemicals and pollutants present in the environment is given. Pesticidal arsenic can cause dermatitis, muscular paralysis, liver and kidney damage, and is suspected to be carcinogenic and teratogenic. Cooperative efforts are underway at OSHA and the EPA to regulate the manufacture and use of wood preservatives containing arsenic. Fungicidal chromates have caused skin ulcers and kidney inflammation in humans. They may also be carcinogens. Revisions to current worker protection rules are planned by OSHA. The EPA is revising controls for these pollutants in drinking water, lakes and streams. DBCP has caused sterility and sperm level reduction among production workers and is suspected of being carcinogenic. Standards are being set by OSHA to protect production workers and the FDA is currently examining treated foods for DBCP residues. EDB (ethylene dibromide) may cause cancer, reproductive damage, and human gene mutations. The EPA has begun to review the risks and benefits of the use of this compound as a pesticide. Pesticidal mercury can cause severe nervous system and kidney damage. Additional water pollution control standards are being prepared by the EPA. The FDA will provide limits on mercury levels in fish and shellfish.

80-2521. Anonymous **Environmental health research.** *Vet. Hum. Toxicol.* 22(1): 42; 1980.

Developments in the field of environmental health during the past 20 yr are briefly reviewed. A large scale recall of amitrole contaminated cranberries in 1959 is used to illustrate the difficulties in resolving environmental health problems. Improvements have been made in the areas of epidemiologic techniques, decision analysis, behavioral science and public awareness of the problems. Progress has been limited in some areas due to the lack of unambiguous data on which to base decisions. Government support of scientists to enter the field of environmental health research is suggested.

80-2522. Tsuda, Y.; Nishimaru, Y. (Dep. Legal Med., Fac. Med., Yokohama Munic. Univ., Yokohama,

Kanagawa, Japan) **[Statistical and sociomedical review on the unnatural death with reference to poisoning (1952 to 1978).]** *Yokohama Igaku (Yokohama Med. J.)* 31(1): 5-15; 1980 (34 references) (Japanese).

A survey of all unnatural deaths in Kanagawa prefecture from 1952 to 1979 indicated 2034 deaths resulted from intoxications. The ratio of intoxication deaths to all deaths has tended to decline in recent years. Pesticides account for 137 of the total intoxication deaths. Suicides accounted for 76.5% of the intoxication cases. Suicide by pesticide also shows a decreasing trend in recent years. Reasons for this trend are discussed.

See also 80-2403, 80-2408, 80-2411, 80-2414, 80-2417, 80-2430, 80-2432, 80-2436, 80-2438, 80-2448, 80-2469, 80-2481, 80-2528, 80-2567 *and* 80-2608.

80-2523. Anonymous **Studies on organochlorine insecticides: experiments on chemical synthesis, insecticidal activity and biodegradability of 1-(3,4- dichlorophenyl-2,2,2-trichloroethyl acetate.** *Acta Entomol. Sinica* 22(4): 390-395; 1979 (6 references).

The synthesis, insecticidal activity, toxicity, and biodegradability of the DDT substitute 1-(3,4-dichlorophenyl)-2,2,2-trichloroethyl acetate were examined and compared with those of DDT. Its LD50 and KT50 to houseflies (*Musca domestica vicina* Macq) were 4.89-5.89 μg/fly and 23 min 44 sec, respectively as compared to 50 μg/fly and 60 min, respectively, for DDT. The DDT substitute gave somewhat better results than did DDT in insect control tests in livestock sheds. When fed to chickens at 1000 ppm for 15 days, the DDT substitute left only trace amounts of residues in thoracic muscle and liver and 167 ppm residue levels in feces. Incubation of chicken liver homogenate with the compound at 37°C resulted in degradation of more than 85% of the DDT substitute after 10 min and 97% after 20 min.

80-2524. Ingebrigtsen, K.; Froslie, A. (Dep. Environ. Toxicol., Natl. Inst. Public Health, Oslo, Norway) **Intestinal metabolism of DNOC and DNBP in the rat.** *Acta Pharmacol. Toxicol.* 46(5): 326-328; 1980 (11 references).

DNOC was rapidly metabolized by rat cecal microorganisms and could longer be detected after 1 hr. Simultaneously, 6-ANOC (the monoamine derivative of DNOC) was detected in increasing amounts, reaching maximum levels after 1 hr, indicating an 80% DNOC conversion. Thereafter, the 6-ANOC concentration decreased until it represented only 3% of the initial DNOC concentration at 12 hr. DAOC (the diamine derivative) concentrations increased over the entire incubation period and reached maximum levels at 12 hr, when it represented 90% of the DNOC conversion. When incubated alone 6-ANOC concentrations decreased and DAOC concentrations increased in the same time-dependent manner observed in the DNOC experiments. Analogous experiments using DNBP (dinoseb) and 6-ANBP (the monamine derivative of dinoseb) gave similar results. However, the metabolic turnovers were slower. Rat cecal microorganisms metabolize DNOC and DNBP to the corresponding 6-amino compounds, which are in turn reduced to the diamino derivatives. Hematologic effects reported in rats exposed to DNBP may have been induced by amino metabolites formed in the intestine from DNBP metabolism.

80-2525. Carricaburu, P.; Lacroix, R.*; Lacroix, J. (Lab. Pharm. Chim., U.E.R. Pharm., F-37032, Tours Cedex, France) **Modifications de l'electroretinogramme de la Souris blanche apres administration parenterale de solvants organiques. [Modifications of white mouse electroretinogram after injection of organic solvents.]** *Ann. Pharm. Fr.* 38(2): 155-160; 1980 (8 references) (French).

Retinian functions disrupted by solvents of organochlorine insecticides and other organic chemicals are examined. The modifications of white mice electroretinograms by ip administrations of DMSO, dimethylformamide, dimethylacetamide and *N*-methylpyrrolidone were determined. DMSO was found to induce two effects; repolarization difficulties of the photoreceptor while retaining excitability and, initial hyperexcitability followed by hypoexcitability on the synapse-biopolar neurons. The other compounds tested exhibited either one or both of these manifestations, although with different degrees of intensity. Most organic solvents have a harmful effect on the functioning of the retina of white mice after acute intoxication. However, polyethylene glycol (mol. wt. 400) induced no toxic effects in the eyes.

80-2526. Haseltine, S. D.; Finley, M. T.; Cromartie, E. (US Fish & Wildl. Serv., Patuxent Wildl. Res. Cent., Laurel, MD 20811) **Reproduction and residue accumulation in black ducks fed toxaphene.** *Arch. Environ. Contam. Toxicol.* 9(4): 461-471; 1980 (28 references).

Three sets of 15 pairs of black ducks (*Anas rubripes*) were given 0, 10, or 50 ppm toxaphene in a dry mash diet for a period of 19 mo, which included 2 breeding seasons. Survival of adults was not affected, but the weights of treated males were depressed during the summer months. Egg production, fertility, hatchability, eggshell thickness, growth, and survival of young did not vary with toxaphene ingestion in either breeding season. However, the mean number of days required to complete a clutch was lower in birds fed toxaphene than in birds on the control diet. Clutches of hens fed 50 ppm toxaphene showed improved hatching success in the second year of the study. Carcass wet-weight (70% moisture) residues in adults and the young birds averaged from 50 to 100% of the dietary concentration (7% moisture); egg residues showed a similar trend. Carcass residues did not reflect those found in the livers or brains of the adults, which seldom exceeded 0.5 ppm. Toxaphene residues were found in the brain of only one 10 ppm bird, but were present in nearly all of the 50 ppm birds. Toxaphene residues were present in the liver of all birds ingesting toxaphene. (Author abstract by permission)

80-2527. Rao, R. R.; Quadros, F.; Mazmudar, R. M.; Marathe, M. R.; Gangoli, S. D. (Toxicol. & Pathol. Dep., Ciba-Geigy Res. Cent., Goregaon East, Bombay 400063, India) **Toxicological effects of aerial application of monocrotophos.** *Arch. Environ. Contam. Toxicol.* 9(4): 473-481; 1980 (13 references).

Aerial application of the insecticide Nuvacron 40 (monocrotophos) had no significant effect on the cholinesterase level of plasma and erythrocytes of cattle, chicken, buffaloes, and human volunteers exposed to the spray. Contamination of canal water with the pesticide was completely eliminated within 24 hr, whereas that in the soil

was reduced by 80% in 72 hr. The degradation of insecticide residue in grass was about 90% in seven days and in cotton leaves about 85% for the same period. (Author abstract by permission)

80-2528. Jusic, A.; Jurenic, D.; Milic, S. (Cent. Neuromuscular Dis., Dep. Neurol., Univ. Zagreb, Zagreb, Yugoslavia) **Electromyographical neuromuscular synapse testing and neurological findings in workers exposed to organophosphorus pesticides.** *Arch. Environ. Health* 35(3): 168-175; 1980 (19 references).

The purpose of this study was to evaluate electromyographic neuromuscular synapse testing and neurological examination for early detection of organophosphorus pesticides intoxication. Two groups of healthy agricultural workers and one group of healthy spraymen were exposed to various organophosphorus pesticides (thimet, malathion, trichlorfon), of different intensities. An additional group of nonexposed agricultural workers was also analyzed for comparative purposes. Before and during exposure, cholinesterase activity was determined. Personal, occupational, medical, and neurological case histories were taken; during the same session electromyographic synapse testing was performed and neurological information was recorded. No significant difference between exposed groups and the control group was found. The electrically evoked muscle potential series in exposed workers remained as constant as those recorded for the control group. The frequency of different types of amplitude changes was the same in exposed groups and in the control group. Neurological records showed no significant deviations from normal for exposed workers. Changes in muscle action potentials described were, therefore, attributed to factors outside the synapse. Electromyographic synapse testing and clinical neurological examination are not sensitive enough for early detection of latent pesticide(s) intoxication. Other tests, especially biochemical ones, should be investigated for early detection of latent intoxication. (Author abstract by permission)

80-2529. Sioris, L. J.; Weibert, R. T.; Pentel, P. R. (Dep. Emergency Med., Hennepin Cty. Med. Cent., Minneapolis, MN 55415) **Potentiation of warfarin anticoagulation by sulfisoxazole.** *Arch. Intern. Med.* 140(4): 546-547; 1980 (10 references).

A case is reported which illustrates the probable potentiation of warfarin's anticoagulant effect by administration of sulfisoxazole. A 66-yr-old woman was hospitalized, diagnosed as having a pulmonary embolus, and was treated with warfarin. Sulfisoxazole was given concurrently for a urinary tract infection. At the time of discharge, her prothrombin time (PT) was 34.0 sec (control 11.9 sec). Four days after discharge, gross hematuria developed and the PT was 43.5 sec (control 11.0 sec). The warfarin dose index (WDI) developed to facilitate detection of warfarin-drug interaction, was applied. The WDI is an empiric formula which weights the effects on the PT of the warfarin doses given over the preceding 84 hr. A rise in the WDI during the course of drug therapy suggests the occurrence of a warfarin-drug interaction. The WDI increased sharply 2 days after starting sulfisoxazole, and remained elevated throughout the course of sulfisoxazole therapy. It is suggested that sulfisoxazole may enhance the anticoagulant effect of warfarin by displacing it from binding sites on serum albumin.

80-2530. Matin, M. A.; Jaffery, F. N.; Kar, P. P. (Ind. Toxicol. Res. Cent., Lucknow, UP, India) **Role of striatal acetylcholine and free ammonia in the central stimulatory effects of *p,p'*-DDT in rats. Protective effects of barbiturates.** *Arch. Toxicol.* 45(1): 29-35; 1980 (30 references).

p,p'-DDT (600 mg/kg, po) produced an increase in the level of free ammonia and a decrease of acetylcholine in the corpus striatum of rats. These effects were maximal 5 hr after the administration of *p,p'*-DDT. The animals showed tremors after 2 hr, mild or moderate convulsions after 3.5 hr and severe convulsions 5 hr after treatment with *p,p'*-DDT. The neuro-chemical changes and convulsions induced by *p,p'*-DDT were modified to different degrees by barbiturates. Phenobarbitone sodium abolished the convulsions while prominal reduced the severity of convulsions in *p,p'*-DDT treated animals. The level of striatal acetylcholine in *p,p'*-DDT-phenobarbitone treated animals was not significantly different from the control values. In prominal-*p,p'*- DDT treated animals, it was slightly but significantly reduced. Primidone neither changed the severity of convulsions nor the level of striatal acetylcholine in *p,p'*-DDT treated animals. Further barbiturates had no significant effect on the level of free ammonia in *p,p'*-DDT treated rats. The results suggest that changes in the level of acetylcholine are not the cause but an effect of *p,p'*-DDT induced stimulatory effects or convulsions, mediated through an increase in the level of free ammonia or some other mechanism. (Author abstract by permission)

80-2531. Oskarsson, A.; Tjalve, H. (Dep. Toxicol., Univ. Uppsala, S-75123 Uppsala, Sweden) **Effects of diethyldithiocarbamate and penicillamine on the tissue distribution of $^{63}NiCl_2$ in mice.** *Arch. Toxicol.* 45(1): 45-52; 1980 (11 references).

The effects of sodium diethyldithiocarbamate (DDC) and dl-penicillamine on the fate of $^{63}Ni^{2+}$ in mice injected with $^{63}NiCl_2$ were studied by whole body auto-radiography and liquid scintillation counting. Sodium diethyldithiocarbamate caused a retention and redistribution of $^{63}Ni^{2+}$ in the tissues. dl-Penicillamine decreased the $^{63}Ni^{2+}$-concentration in the tissues. The nickel-diethyldithiocarbamate complex is lipophilic, whereas the nickel-dl-penicillamine complex is hydrophilic, and these differences in chemical properties may determine the different

effects which these chelating agents have on the fate of Ni^{2+}. (Author abstract by permission)

80-2532. Cook, W. L.; Fiedler, D.; Bourquin, A. W. (Dep. Biol., Georgia State Univ., Atlanta, GA 30303) **Succession of microfungi in estuarine microcosms perturbed by carbaryl, methyl parathion and pentachlorophenol.** *Bot. Mar.* 23(2): 129-131; 1980 (3 references).

Microcosms established from a Florida estuarine salt marsh were challenged with carbaryl, methyl parathion or PCP to study the succession of microfungal communities. Labeled carbaryl and methyl parathion were introduced into continuous-flow microcosms at a rate of 14 ml/hr to yield a final level of 214 μg/l in the growth vessel for carbaryl and 75 μg/l for methyl parathion. Labeled PCP was added to a sediment-water test system at 140 μg/l. Water and detritus samples were taken approximately every wk from March 12 to July 26, 1979, and the microbial populations present were cultured and identified. In the carbaryl-treated microcosm, resident fungi were succeeded by *Fusarium*. In the microcosm treated with methyl parathion, *Trichoderma* predominated initially but were succeeded largely by *Penicillium chrysogenum* in the final samplings. In the PCP-treated system, a *Penicillium canescens* series occurred. $^{14}CO_2$ was also released in small quantities from xenobiotic molecules of selected fungi from the microcosms.

80-2533. George, M.; Hedworth-Whilty, R. B. (North Devon Dist. Hosp., Barnstaple, Devon EX31 4JB, England) **Non-fatal lung disease due to inhalation of nebulised paraquat.** *Br. Med. J.* 280(6218): 902; 1980 (1 reference).

A 64-yr-old woman was exposed to nebulised paraquat sprayed on a field adjacent to her home. A mist drifted from the field into her garden. After about 10 min, tightness in her chest was noted and she retired inside. The mist completely defoliated the garden and killed several mice and voles. One wk after exposure she was treated with corticosteroids. She was observed in a hospital nearly 2 mo after exposure. Severe dyspnea was experience on slight exertion. Ventilatory function tests showed no evidence of airway obstruction, but did demonstrate severe restriction. She was given enteric-coated prednisolone tablets 2.5 mg twice daily. Chest radiographs remained clear during treatment.

80-2534. Cremer, J. E.; Cunningham, V. J.; Ray, D. E.; Sarna, G. S. (MRC Toxicol. Unit, Med. Res. Counc. Lab., Carshalton, Surrey SM5 4EF, England) **Regional changes in brain glucose utilization in rats given a pyrethroid insecticide.** *Brain Res.* 194(1): 278-282; 1980 (19 references).

The effect of decamethrin on regional brain glucose utilization was studied in male L.A.C. Porton rats. Decamethrin was administered ip as a 40 mg/ml solution in glycerinformal. After dosing with the pyrethrin insecticide, each animal was given 0.2 ml of (U-^{14}C)2-deoxyglucose at the onset of spontaneous writhing; 2 min later each rat received iv 2 ml of (1-^{3}H)2-deoxyglucose. After 3 min the rats were sacrificed by microwave irradiation to the head and brain regions were dissected and analyzed for glucose and radioactive content of 2-deoxyglucose and 2-deoxyglucose-phosphate. Rats given decamethrin showed a progressive increase in blood glucose levels. During choreoathetosis the average blood glucose level of the decamethrin dosed rats was 13.28 ± 0.64 S.E.M. and that the control animals was 8.47 ± 0.41. This increase was most pronounced in cortex and hippocampus. The glucose utilization rate was significantly increased in the cerebellum, colliculi and hypothalmus of decamethrin dosed rats. Dosing of rats with diazepam, clonazepam or sodium valproate at levels which blocked pentylenetetrazol-induced convulsions did not prevent the onset of decamethrin-induced motor symptoms. Therefore it seemed unlikely that decamethrin acts directly on GABAergic neuronal pathways.

80-2535. De Coster, A.; Naeije, R.; Hallemans, R.; Cornil, A. (Dep. Voies Respir., Hop. Univ. Saint-Pierre, B-1000 Brussels, Belgium) **Etiopathogenie des cedemes pulmonaires lesionnels. [Etiopathogeny of edematous pulmonary lesions.]** *Bronchopneumologie* 30(2): 83-97; 1980 (37 references) (French).

The etiopathology of edematous pulmonary lesions (EPL, a syndrome characterized by progressive, sometimes irreversible respiratory insufficiency) and the reaction of the lungs to stress from a wide variety of sources (including the accidental ingestion of paraquat) is reviewed. EPL is defined as an initially interstitial edema caused by a change in the permeability of pulmonary capillaries and subsequent alteration of the alveolo-capillary barrier. Different acute stages of EPL account for the absence of a correlation among the clinical, radiological and hemodynamic symptoms. Paraquat-induced EPL is characterized by interstitial fibrosis which may be partially or wholly reversible resulting in functional recovery. Modern treatment techniques have considerably reduced mortality even in most severe afflictions. In contrast to EPL, the acute respiratory distress syndrome of the Vietnam war (Danang lung) was observed in soldiers who have suffered severe trauma.

80-2536. Marsico, S. A.; Severi, B.; Grillone, G.; Zanoni, A. (Clin. Tisiol. & Mal. Respir., II Fac., Osp. Monaldi, Naples, Italy) **Ultrastructural changes in the non cardiogenic pulmonary oedema.** *Bronchopneumologie* 30(2): 111-129; 1980 (74 references).

Non-cardiogenic pulmonary edema, a pathological condition characterized by an abnormal increase in extravascular lung water, is described. The chief features of the alveolar-capillary membrane permeability are reviewed. Electron micrographs are presented showing morphological features of the sheep lung 3 and 24 hr after hemorrhagic shock induction. At 3 hr, the distribution pattern of lesions was heterogenous, with focally altered areas alternating with entirely undamaged areas. The most striking feature was interstitial edema, but morphological lesions in endothelial and epithelial layers were also present. After 24 hr typical hyaline membranes adherent to alveolar walls and well developed alveolar edema were found. Some morphological differences related either to the nature or the penetration route of the injurious agents are discussed. Nitrogen dioxide causes epithelial damage, while agents that reach the lung by pulmonary circulation (such as alpha-naphthylthiourea, ANTU) cause endothelial damage. However, the predominant cellular damage cannot always be explained by the penetration route. In the case of paraquat the membranous pneumocytes are generally the major target cells, and there is easy development of interstitial fibrosis. Possible reasons suggested for the differences in reactions may be variations in the affinity of the injurious agents for the cellular components and variability in the pattern of repair reactions.

80-2537. Schultz, T. W.; Allison, T. C. (Dep. Biol., Pan American Univ., Edinburg, TX 78539) **Toxicity and toxic interaction of aniline and pyridine.** *Bull. Environ. Contam. Toxicol.* 23(6): 814-819; 1979 (19 references).

The acute toxicities of aniline and pyridine and their toxic interactions on population growth and density of the ciliate *Tetrahymena pyriformis* were studied. Three mixtures of the 2 compounds and one concentration of each alone were tested. Aniline ranged from 18,750 to 75,000 ppm and pyridine ranged from 143,750 to 575,000 ppm. The effects of the 2 compounds were inversely related to concentration. Aniline inhibited growth at approximately one order of magnitude less than pyridine (250 and 2500 ppm, respectively). Mixtures of the 2 compounds were less toxic than either added separately. It is suggested that addition of fractional toxicities may produce considerable error.

80-2538. Fang, S. C. (Dep. Agric. Chem., Oregon State Univ., Corvallis, OR 97331) **Comparative study of uptake and tissue distribution of methyl mercury in female rats by inhalation and oral routes of administration.** *Bull. Environ. Contam. Toxicol.* 24(1): 65-72; 1980 (4 references).

The uptake and distribution of methyl mercury by inhalation and oral routes of administration were compared. Female wistar rats were exposed to ^{203}Hg methylmercuric chloride (^{203}Hg-MMC) vapor for 6, 12, 18 and 24 hr to determine uptake as a function of exposure time. In a second experiment, rats were exposed for 24 hr to 50, 100 or 140 nmol ^{203}Hg-MMC/*l*. In a third experiment, rats were given oral doses of either 3 or 9 μmol ^{203}Hg-MMC and sacrificed after 1, 2, 3 or 4 days. Body tissues were analyzed for radioactivity. Mercury concentrations in most organs increased linearly with time of exposure. Blood accumulated mercury the fastest. The relative ^{203}Hg content in each organ or tissue remained fairly constant among the 3 inhaled concentrations. Rats given oral doses showed increased mercury levels on day 1, then a slow decline. The brain was the only exception; levels increased throughout the time of the study. Data suggest that when inhaled, mercury is retained in the blood at a greater rate than when ingested. Analysis of subcellular fractions of liver, kidney, and brain demonstrated no difference in the distribution of ^{203}Hg whether the route of administration was oral or by inhalation.

80-2539. Medeiros, D. M.; Cadwell, L. L.; Preston, R. L. (Dep. Biol. Sci., Illinois State Univ., Normal, IL 61761) **Possible physiological uptake mechanism of methylmercury by the marine bloodworm *(Glycera dibranchiata).*** *Bull. Environ. Contam. Toxicol.* 24(1): 97-101; 1980 (13 references).

The uptake mechanism of methyl-mercury from water in a lower food-chain organism, the marine bloodworm *(Glycera dibranchiata)*, was determined. Whole bloodworms were exposed to 10 ppb ^{203}HgCl. Mercury uptake was monitored for 4 days. Repeated whole body counts were made using a scintillation counter. In another experiment, bloodworms were exposed to ^{203}Hg for 30 min, and were then placed in sea water or sea water containing 50 m*M* cysteine, where elimination was monitored periodically for 8 hr. Mercury uptake was extremely rapid. In the elimination experiments, approximately 70% of the ^{203}Hg present after exposure remained after the 8 hr elimination period in the sea water group; however, only 14% remained in the group exposed to sea water plus cysteine. It was suggested that the effect of cysteine on uptake was due to the availability of sulfhydryl groups, since cysteine has the ability to remove methyl mercury bound to surface sulfhydryl groups. However, experiments with body wall sections pretreated with sulfhydryl inhibitors prior to $CH_3{}^{203}$HgCl failed to support this hypothesis. Partition coefficient experiments were carried out to examine the influence of cysteine on mercury solubility, and it was determined that cysteine reduces the lipid solubility of $CH_3{}^{203}$HgCl. Thus, the initial rapid uptake phase could be due to the absorption of methyl mercury that had been solubilized by lipids at or near the external body wall surface.

80-2540. Anderson, A. c.; Abdelghani, A. A. (Dep. Environ. Health Sci., Sch. Public Health & Trop. Med., Tulane Univ., New Orleans, LA) **Toxicity of selected arsenical compounds in short term bacterial bioassays.** *Bull. Environ. Contam. Toxicol.* 24(1): 124-127; 1980 (13 references).

Short term bacterial bioassays were performed on arsenic compounds. The soil bacteria *Citrobacter frundii, Aeromonas sp.* and *Klebsiella sp.* were grown in test nutrient containing either monosodium methanearsonate (MSMA), sodium arsenate or sodium arsenite. MSMA ranged in concentration from 10,000 μg/ml to 80,000 μg/ml; sodium arsenate and sodium arsenite ranged from 100 to 100,000 μg/ml and to 10,000 μg/ml, respectively, in logarithmic series. The 24 hr LC50 for MSMA was 27,000 μg/ml. The LC50 for sodium arsenate was 1300 μg/ml, and the LD50 for sodium arsenite was 279 μg/ml. It is suggested that these procedures represent an efficient screening technique to rapidly assess the toxicity of compounds to microorganisms.

80-2541. Strik, J. J. T. W. A.; Centen, A. H. J.; Janssen, M. M. T.; Harmsen, E. G. M.; Villeneuve, D. C.; Chu, I.; Valli, V. E. (Dep. Toxicol., Agric. Univ., Wageningen, The Netherlands) **Toxicity of photomirex with special reference to porphyria, hepatic P450 and glutathione levels, serum enzymes, histology and residues in quail and rat.** *Bull. Environ. Contam. Toxicol.* 24(3): 350-355; 1980 (9 references).

Studies were performed on rats and quail to determine toxic, physiological and histological effects of photomirex. Subacute toxicity was determined on both rats and quail; 100 ppm photomirex were fed to both for 27 days, controls received no pesticide. The effects of four oral dosages (0, 100, 500 or 1000 mg/kg) were also determined for the quail. After 37 days, blood, liver and kidney were analyzed. Excreta were analyzed on days 8, 15, 22, 29 and 36. Single doses of up to 1000 mg/kg for quails or 100 ppm diet for quails and female rats for 27 days caused increased liver weight and cytoplasmic enlargement of hepatocytes. In quails the hepatic cytochrome P-450 content increased. However, glutathione levels and serum profiles did not indicate severe damage to the liver, nor were there any signs of porphyria or necrosis.

80-2542. Leroux, P.; Gredt, M. (Lab. Phytopharm., Inst. Natl. Agron., C.N.R.A., F-78000 Versailles, France) **Effects of barban, chlorbufam, chlorpropham and propham on various strains of *Botrytis cinerea* Pers and *Penicillium expansum* Link sensitive or resistant to carbendazim and thiabendazole.** *C. R. Acad. Sci. Ser. D.* 289(9): 691-693; 1979 (8 references).

Two types of comportment were noted with *N*-phenyl-carbamate herbicides and strains of *Botrytis cinerea* or *Penicillium expansum* resistant to benzimidazole fungicides. The herbicides used in the study included barban, chlorobufam, chlorporpham and propham. Some resistant strains grow in the same manner as do the sensitive ones. Others are inhibited by lower concentrations of herbicides; a negatively correlated cross resistance is noted between these two groups of antimitotic compounds.

80-2543. Roush, R. T.; Hoy, M. A. (Univ. California, Berkeley, CA) **Selection improves Sevin resistance in spider mite predator.** *Calif. Agric.* 34(1): 11-14; 1980.

A genetic selection program was carried out to develop a carbaryl (Sevin)-resistant strain of *Metaseiulus occidentalis*, a predator of the spider mite. The spider mite is responsible for large crop losses in California. The first step of the program was mass hybridization of colonies (none detectably resistant to carbaryl) collected from 18 locations to provide adequate genetic variability. Two genetic selection methods were used; rearing predators and prey on pinto bean plants and spraying them with increasing doses of carbaryl, or treating just the immature, motile stages and adult males on pieces of moistened filter paper. Both methods produced a high level of resistance; after 15-19 rounds of selection, about 83% of the selected strains survived compared to about 2% of the unselected strain. Laboratory tests showed no affect on the vigor of these laboratory-selected predators. Carbaryl resistance did not appear to break down over time. Field releases in almond orchards indicated that the strain was able to survive carbaryl application and control the spider mites.

80-2544. Gammie, J. (Anim. Med. Clin., Penticton, British Columbia V2A 3J8, Canada) **Sodium fluoroacetate poisoning in a cat.** *Can. Vet. J.* 21(2): 64; 1980 (3 references).

A case of accidental poisoning of a cat by the rodenticide sodium fluoroacetate (compound 1080) is described in this letter to the editor. The cat was observed consuming a dead chipmunk in the area of a granary where sodium acephate had been applied as a control measure. Most of the ingested rodent was vomited within 1 hr. Clinical symptoms included rapid abdominal respiration, marked hyperesthesia to light and tough reflexes, and moderate bilateral pulmonary congestion. Treatment included supplementary O_2 and injection of calcium gluconate, diazepam, and flurosemide. Slow progress was made initially, and within 1 wk full recovery was attained. It is noted that there is no specific antidote for this type of poisoning, but supportive treatment and control of convulsions are of the first priority. This compound is a very potent poison due to the cellular mechanism of action by fluoroacetate in combining with oxaloacetic acid in the Kreb's citric acid cycle, and blocking cellular respirations.

80-2545. Hutson, D. H.; Wright, A. S. (Shell Toxicol. Lab., Shell Res. Ltd., Tunstall, Sittingbourne, Kent ME9 8AG, England) **The effect of hepatic microsomal monooxygenase induction on the metabolism and toxicity of the organophosphorus insecticide chlorfenvinphos.** *Chem. Biol. Interact.* 31(1): 93-101; 1980 (11 references).

Experiments were performed in which the metabolism and toxicity of chlorfenvinphos was altered by the induction of monooxygenase in rat liver. Ten-wk-old male rats were fed chlorfenvinphos at 5-40 mg/kg, and a

similar group received dieldrin for 12 days prior to chlorfenvinphos at 40-240 mg/kg. The induction of monooxygenase by dieldrin caused a ten-fold decrease in the toxicity of chlorfenvinphos. The protection was concluded to be due to enhanced detoxification by oxidative dealkylation. The results show that the induction of dealkylchlorofenvinphos is dose dependent.

80-2546. Hathway, D. E. (Imp. Chem. Ind. Ltd., Cent. Toxicol. Lab., Alderley Park, Cheshire SK10 4TJ, England) **The importance of (non-enzymic) chemical reaction processes to the fate of foreign compounds in mammals.** *Chem. Soc. Rev.* 9(1): 63-89; 1980 (91 references).

The metabolism of various types of foreign compounds is considered wherein a chemical reaction occurring *in vivo* is thought to play a significant role affecting the outcome of the exposure of mammals to the foreign chemical. Drugs, pesticides, herbicides and industrial chemicals are briefly discussed in relation to this type of metabolic pathway. Unusual ring closures occur during the metabolism of substituted 2,6-dinitroaniline herbicides such as trifluralin, profluralin and fluchloralin. Each of these produces a common *N*-de-alkylation product and a second metabolite with a reduced nitro-group. It is suggested that the unusual metabolites produced by these chemical reactions may aid the spread of the biological activity associated with the parent compound. It is also noted that the formation of new compounds via these chemical reactions may allow for the appearance of carcinogens which are activated during the metabolic process.

80-2547. Misra, D.; Khanna, R. N.; Anand, M.; Gopal, K. (Ind. Toxicol. & Res. Cent., Mahatma Gandhi Marg, Lucknow 226001, India) **Effect of endosulfan on blood glucose.** *Chemosphere* 9(2): 119-121; 1980 (7 references).

Adult cats were used in studies designed to determine the effects of the chlorinated insecticide endosulfan on blood glucose. Five groups of 4 animals each were established. All cats were anesthetized, tracheas cannulated, and animals ventilated with a respiratory pump. The control group received no other treatment, while groups II, III and IV were given a single iv dose of endosulfan (2, 3 or 5 mg/kg, respectively) through a cannula inserted into a femoral vein. Animals in Group V were adrenalectomized bilaterally, and after a rest period of 4 hr, were given an iv dose of 3 mg endosulfan/kg. In all tests, blood was drawn from the femoral vein in heparinized tubes at 0, 15 min, 30 min, 1 hr, 2 hr and 4 hr intervals, and immediately precipitated out for glucose estimation. Animals dosed with 2 mg/kg exhibited muscular twitchings followed by convulsions, but no change in blood glucose levels occurred at this dose. Doses of 3 and 4 mg/kg produced a marked rise in blood glucose level after 15 and 30 min, with a gradual fall up to 4 hr. Adrenalectomy prevented this rise in glucose level.

80-2548. Fox, J. (Div. Lab. Animl. Med., Massachusetts Inst. Technol., Cambridge, MA 02139) **Selected aspects of animal husbandry and good laboratory practices.** *Clin. Toxicol.* 15(5): 539-553; 1979 (54 references).

A review is presented of aspects of environmental and management parameters that directly affect animal health and maintenance, particularly for rodents on long-term bioassay testing. The effects of poor husbandry on reporting of toxicology results are stressed. The factors influencing selection of facility design and managerial operation are discussed, along with the effects of temperature and humidity on laboratory animals. Also considered are methods of dosing with chemicals, along with techniques for preventing contamination. The personnel required to carry out toxicological studies are discussed, and the importance of careful clinical surveillance and assessment stressed. It is noted that laboratory animals are also exposed to chemicals other than those administered purposefully for testing. The presence of these chemicals could affect results, so it is important that they be monitored and avoided. Sources are chemicals present in municipal water supplies, disinfectant sprays and deodorizers, spilled insecticides, and insecticides and other toxins present in feed. Insecticides commonly used in the animal facility have been shown to be potent inducers of hepatic microsomal enzymes of rodents and to have deleterious effects on the immune system of laboratory rodents. The acceptable levels of feed contamination for commercial rations manufactured for rodent use are given in tabular form. Maximum concentrations (μg/kg) are 0.50 for PCBs and malathion, 0.05 for ΣDDT, and 0.01 for dieldrin, lindane and heptachlor.

80-2549. Nandakumar, N. V.; Bhaskar, S. U.; Rao, M. G.; Hariharan, N. V.; Majumder, S. K. (Dep. Zool., Sri Venkateswara Univ., Tirupati 517 502, India) **Cholinesterase antagonistic properties of *Parthenium hysterophorus* extracts, and its possible role as pest controlling agent.** *Comp. Physiol. Ecol.* 5(1): 46-48; 1980 (5 references).

The weed *Parthenium hysterophorus*, which can cause dermatitis and allergic reactions, was examined for possible anticholinesterase properties. It has been suggested as an anticholinesterase agent for possible control of various pests. Cockroach nervous tissue and sheep liver homogenates were incubated with extracts of leaves of the plant, and cholinesterase activity was determined. Both water and acetone extracts showed enzyme inhibition. Inhibition increased with increasing extract concentration.

80-2550. Aoyama, K.; Matsushita, T. (Sch. Hyg. Fac. Med., Kagoshima Univ., Kagoshima, Japan) **[Studies on predicting contact sensitization in mice.]** *Dai Kai Nippon Sangyo Eisei Gakkai Koenshu (Proc. Jpn. Soc. Ind. Hyg.)* 53: 491-492; 1980 (Japanese).

An inexpensive, convenient method for predicting chemical contact sensitization is described. The degree of swelling of the mouse earlobe was used to indicate chemical sensitization upon re-exposure to the sensitizing agent. To test the method shaved ICR mice (4-12-wk-old) were painted with 0.05 ml of 0.5% solutions of dinitrofluorobenzene (DNFB)/day for 3 consecutive days. At 1 wk after initial induction, both earlobes were painted with a challenge dose of 0.04 ml of 0.2% DNFB solution and the degree of earlobe swelling was recorded at 6, 24 and 48 hr. Controls were not initially treated but were given the challenge dose. The best animal model was determined to be female mice aged 9-10 wk. In tests with maneb and thiram, 20% induction doses and 0.2% challenges, results indicated that the mouse was a less sensitive animal model for determining contact allergenic responses than the guinea pig.

80-2551. Nishida, N.; Kudo, Y.; Nakamura, I.; Maruyama, N.; Nambu, T.; Kagami, M. (Sch. Hyg., St. Marianna Med. Coll., Kawasaki, Kanagawa, Japan) **[On the resistance of erythrocytes to osmotic pressure, examined on inhabitants in an agricultural region.]** *Dai Kai Nippon Sangyo Eisei Gakkai Koenshu (Proc. Annu. Meet. Jpn. Soc. Ind. Hyg.)* 53: 493-494; 1980 (Japanese).

Results of the examination of the resistance of erythrocytes to osmotic pressure were compared to the results of other tests on inhabitants of an agricultural village. Animal tests were carried out using fenitrothion, disulfoton, methomyl and zineb at a dose of 0.1 LD50. Reduced erythrocyte resistance to osmotic pressure was noted in the farming season as compared to other seasons. This is parallel to the reduction of cholinesterase activity and abnormality of hematocrit value of the inhabitants. In animal tests resistance of erythrocytes (HSP) was reduced in the early stage after administration of methomyl or zineb. Erythrocyte resistance of HEP was reduced after administration of zineb. After administration of fenitrothion or disulfoton the resistance of erythrocyte to osmotic pressure was raised in HSP and HEP. Rabbit plasma-cholinesterase activity was reduced after administration of methomyl, fenitrothion and disulfoton. The administration of zineb did not cause a reduction of the cholinesterase activity.

80-2552. Rickard, R. W. (Univ. Kentucky, Lexington, KY) **Chemical properties and potential toxicological significance of *N*-nitrosocarbamates.** *Diss. Abstr. Int. B* 40(12): 5595; 1980.

Although there has been much concern over the potential for the *in vivo* synthesis of nitrosocarbamate pesticides, there is no conclusive evidence that these carcinogens are formed in the mammalian stomach. Chemical nitrosation of ^{14}C-labeled carbaryl, carbofuran and *p*-chlorophenyl *N*-methylcarbamate (PCMC) at 0.5 μmol were incubated in HCl solutions of various pH at 37°C was investigated. The effect of pH on the stability of the nitrosocarbamates was also investigated. The Ames *Salmonella typhimurium* assay was used to compare the mutagenicity of the nitrosocarbamates. Each compound was a potent direct mutagen to strains TA1535 and TA100, but no activity was found with TA98. Dose response curves demonstrated nitrosocarbaryl was the most mutagenic of the compounds and nitrosocarbofuran the least. Carbaryl, carbofuran and methylurea were selected for *in vivo* nitrosation studies in the rat and the guinea pig. Simultaneous intubation of rats with < 1 μmol of the carbamate and 1160 μmol of sodium nitrite resulted in a 0.02% nitrosation compared to a 0.33% yield for nitrosomethylurea. Nitrosation in the guinea pig was approximately 1% for the carbamates and 5% for methylurea. Higher yields in the guinea pig were attributed to its lower stomach pH of 1.5 compared to pH 3.5-5.5 in the rat. This study demonstrated *in vivo* formation of nitrosocarbamates at carbamate and nitrite concentrations representative of human exposure. It is suggested, therefore, that chronic exposure to carbamates and nitrite could result in a potential health hazard. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8010517)

80-2553. Hsia, M. T. S.; Kreamer, B. L.; Burant, C. F.; Treutelaar, M. K. (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706) **General health effects of prolonged exposure to 3,3′,4,4′-tetrachloroazobenzene and 3,3′,4,4′-tetrachloroazoxybenzene in rats.** *Drug Chem. Toxicol.* 3(1): 47-56; 1980 (17 references).

Male Sprague-Dawley rats were fed milled rat chow containing 100 ppm TCAB or TCAOB. Animals received the contaminated food for 120 days. Changes in general body health of the rats was observed with prolonged exposure. A significant decrease in body wt was noted. Changes were observed in hematocrit, red blood cell count and hemoglobin content of blood samples. TCAOB caused the greater changes. Liver, spleen and testis wt were affected; TCAOB caused the more pronounced changes. The increase in liver weight was probably due to the proliferation of smooth endoplasmic reticulum of the hepatocytes. Total lipids and GOT of the animals were elevated.

80-2554. Smies, M.; Evers, R. H. J.; Peijnenburg, F. H. M.; Koeman, J. H.* (Dep. Toxicol., Agric. Univ., Wageningen, The Netherlands) **Environmental aspects of field trials with pyrethroids to eradicate tsetse fly in Nigeria.** *Ecotoxicol. Environ. Saf.* 4(2): 114-128; 1980 (8 references).

Ten river valleys were treated with pesticides for tsetse fly control. Seven valleys were treated by aerial application and 3 by ground spray. Pesticides used included permethrin, cypermethrin (150 g AI/ha) and decamethrin (30 g AI/ha). Almost complete success was obtained with cypermethrin and decamethrin at the above concentra-

tions. No effects were noted on vertebrate populations. Many terrestrial and aquatic arthropods suffered acute mortality, particularly water beetles and crustaceans. Significantly reduced numbers of flying insects were found in the area for 10 days after spraying. In the time immediately after spraying shrimps and mayfly larvae disappeared from the river benthos. However, they were found in samples taken 1 yr later.

80-2555. Dive, D.; Leclerc, H.; Persoone, G. (Inst. Natl. Sante & Rech., Med., Unite 146, Ecotoxoicol. Microbienne, Domaine CETTA, F-59650 Villeneuve d'Ascq, France) **Pesticide toxicity on the ciliate protozoan *Colpidium campylum*: possible consequences of the effect of pesticides in the aquatic environment.** *Ecotoxicol. Environ. Saf.* 4(2): 129-133; 1980 (11 references).

The holotrichous ciliate *Colpidium campylum* was exposed to 39 pesticides. A monoxenic culture of *C. campylum* cultivated on *Escherichia coli* was used. Reduction of the number of generations in increasing concentrations of the toxicants (up to 10 ppm) was determined. Protozoa were counted with a Coulter counter after 0 and 43 hr of incubation. A minimal active dose (MAD) was calculated for each pesticide. Twenty one of the pesticides tested were not toxic to *Colpidium*. The most toxic compounds were pentachlorophenol (PCP), hexachlorophene, thiram and azinphos-methyl (MAD < 1 ppm). Bromophos-methyl, biphenyl, fenchlorophos (ronnel), heptachlor epoxide, and methyl parathion were found to have MADs between 1 and 10 ppm. It is noted that organophosphorus products are generally more toxic than organochlorine chemicals; fungicides are generally harmful to this species; and herbicides tend to have a low toxicity. *C. campylum* is very resistant to pesticides in comparison with *Daphnia pulex*, and is concluded to be a poor indicator of pesticide pollution.

80-2556. Reardon, R.; Metterhouse, W.; Balaam, R. (Gypsy Moth Program, Northeastern Area State & Priv. For., USDA, Hamden, CT 06514) **Impact of aerially applied *Bacillus thuringiensis* and carbaryl on gypsy moth (Lepidoptera: Lymantriidae) and adult parasites.** *Entomophaga* 24(3): 305-310; 1979 (9 references).

A 465 ha area in northwestern New Jersey was divided into 3 blocks for treatment. Of this area, 183 ha were treated with Sevin 4 oil (carbaryl), 176 ha were treated with Dipel *(Bacillus thuringienisis)* and 106 ha were left untreated. Trees in the area were mostly chestnut oak and white oak. The host population of gypsy moth ranged from 1255 to 3027 egg masses/0.4 ha. Dipel was applied twice, each application at a dosage of 8 BIU/0.4 ha. The rate of application was 7.6 l/0.4 ha. Sevin 4 oil was applied once at a dose of 0.45 kg AI/0.4 ha; the rate of application was 0.95 l/0.4 ha. Both chemicals were applied for the first time on May 30, at which time at least 75% of the larvae were in the 2nd and 3rd stages, and white oak foliage had expanded by 50%. Dipel was also applied on June 6. Adult, gypsy moth-parasite insects were collected in 1973 and 1974 from the 3 areas at pre- and post-spray intervals. No significant differences in the numbers of any insect species were observed among the areas before spraying. Significantly fewer *Brachymeria intermedia* and Sarcophagidae, Braconidae, Chalcididae, Sarcophagidae and common species of Tachinidae were collected from treated blocks. Reasons for the reduced numbers of parasites include direct mortality from the insecticides and indirect mortality from host population reduction.

80-2557. Semtner, P. J. (South. Piedmont Res. & Cont. Ed. Cent., Virginia Polytech. Inst. & State Univ., Blackstone, VA 23824) **Insect predators and pests on tobacco following applications of systemic insecticides.** *Environ. Entomol.* 8(6): 1095-1098; 1979 (10 references).

Soil incorporated systemic insecticides applied to flue-cured tobacco were evaluated for their effects on beneficial insects. Tobacco treated with aldicarb, aldoxycarb, disulfoton 15G, and fosthietane had significantly fewer spined stilt bugs than the untreated checks during at least one of the 2 yr of the experiment. During 1977, disulfoton 6EC and ethoprop treatments had as many or more stilt bugs than the check, while oxamyl had the most stilt bugs of the chemical treatments during 1978. There were serious outbreaks of the tobacco hornworm, *Manduca sexta* (L.), and the tomato hornworm, *M. quinquemaculata* (Haworth), in the aldoxycarb and aldicarb plots during 1977 and 1978 and in the disulfoton 15G plots during 1978. Stilt bug to hornworm ratios for aldicarb and aldoxycarb treatments were 14-25% of the untreated check during 1977 and 31-46% of the check during 1978. Carbofuran treated tobacco had stilt bug to hornworm ratios of 1.7-2.6 times higher than the check during 1977 and 2.6-49 times higher than the check during 1978. The high stilt bug to hornworm ratios in the carbofuran treatments were due to the excellent hornworm control. *Geocoris* spp., *Nabis* spp., and the convergent lady beetle, *Hippodamia convergens* Guerin-Meneville, were most abundant in the treatments with poor green peach aphid, *Myzus persicae* (Sulzer), control including oxamyl, ethoprop, and aldoxycarb broadcast. (Author abstract by permission)

80-2558. McCoy, C. W.; Heimpel, A. M. (Agric. Res. Cent., IFAS, Univ. Florida, Lake Alfred, FL 33850) **Safety of the potential mycoacaricide, *Hirsutella thompsonii*, to vertebrates.** *Environ. Entomol.* 9(1): 47-49; 1980 (10 references).

The safety to mammals of a potential microbial pesticide, the fungus *Hirsutella thompsonii* Fischer, was evaluated. A standard mycelial-conidial preparation (0.2 g wet wt mycelia, 2.4×10^7 conidia/ml) was used. In acute oral toxicity and pathogenicity tests rats were administered 1 ml standard solution by oral intubation. After 21 days no

injurious effects were noted. Primary skin and eye irritation studies were conducted on rabbits. Eye irritation studies (0.1 ml applied to conjuctival sac of the left eye) produced no toxic or pathogenic signs. Skin irritation studies (0.5 ml applied to skin) produced no dermal irritation. Guinea pigs were used in acute dermal toxicity tests. A 0.1 ml dose was applied. No mortality, skin irritation, or significant changes in body wt, food consumption or body temperature were noted. Acute inhalation toxicity and pathogenicity was evaluated with rats. Animals were exposed to 2.4×10^7 conidia/animal. Normal appearance and behavior were observed during and for 14 days after exposure. No mortality occurred. Treated animals exhibited slightly lower body wt and food consumption than controls.

80-2559. Bower, C. C.; Kaldor, J. (Agric. Res. Stn., Bathurst, New South Wales 2795, Australia) **Selectivity of five insecticides for codling moth control: effects on the two-spotted spider mite and its predators.** *Environ. Entomol.* 9(1): 128-132; 1980 (21 references).

Five insecticides were tested against *Laspeyresia pomonella* (L.), and their effects on *Tetranychus urticae* (Koch) and its predators were determined. The broad spectrum insecticides permethrin (0.013%), azinphos-methyl (0.05%) and leptophos (0.04%) gave equal control of *L. pomonella* under a 3 wk program of 7 sprays. Poorer control was given by the selective chemicals chlordimeform (0.05%) and diflubenzuron (0.05%). Both chlordimeform and permethrin suppressed *T. urticae* populations. No predators of mites were found on permethrin treated trees and very few were found on trees sprayed with the organophosphates. Chlordimeform appeared relatively harmless to all stages of *Stethorus* spp. and diflubenzuron appeared harmless to *Stethorus* adults, but was toxic to the eggs. Small numbers of predatory mites of 3 species were recovered from diflubenzuron treated trees towards the end of the season. (Author abstract by permission)

80-2560. Singh, H.; Singh, T. P. (Dep. Zool., Fish Endocrinol. Lab., Banaras Hindu Univ., Varanasi 221005, India) **Short-term effect of two pesticides on lipid and cholesterol content of liver, ovary and blood serum during the pre-spawning phase in the freshwater teleost, *Heteropneustes fossilis* (Bloch).** *Environ. Pollut.* 22(2): 85-90; 1980 (18 references).

Studies were performed to determine the effects of Cythion (malathion) and Hexadrin (endrin) on several physiological parameters of pre-spawning *Heteropneustes fossilis*. Fish were acclimated for 2 wk in aquaria at a temperature range of 24-27°C. Five groups of 5 fish each were then exposed to 2 concentrations of each pesticide, the 96 hr initial median lethal concentration [LC(I)50], and the 96 hr safe concentration (SC), for 4 days. At the end of 4 days, fish were sacrificed and the liver, ovary and a sample of blood serum were taken from each fish. Lipid and cholesterol levels were estimated for liver and ovary. No significant change in the lipid contents of ovary and liver was observed after exposure to either pesticide. The cholesterol content of blood serum and liver showed no statistically significant changes, but concentrations in the ovary increased after exposure to both concentrations of both pesticides. The control had 569.29 mg cholesterol/100 g ovary. SC of Cythion resulted in 754.16 mg; LC(I)50 of Cythion resulted in 884.8 mg; SC of Hexadrin resulted in 843.06 mg; and the LC(I)50 of Hexadrin resulted in 822.94 mg of cholesterol/100 g ovary. Longer term experiments during different phases of reproduction of this important food fish are in progress.

80-2561. Anderson, R. L.; DeFor, D. L. (US EPA, Environ. Res. Lab., Duluth, MN 55804) **Toxicity and bioaccumulation of endrin and methoxychlor in aquatic invertebrates and fish.** *Environ. Pollut.* 22(2): 111-121; 1980 (21 references).

Twenty-eight day toxicity test of endrin and methoxychlor were carried out using aquatic invertebrates, with survival and changes in behavior used as measures of toxic effects. The concentrations used were 0.03 ± 0.01, 0.07 ± 0.02, 0.15 ± 0.02, 0.026 ± 0.05 and 0.60 ± 0.11 μg/l for endrin, and 0.15 ± 0.04, 0.42 ± 0.10, 1.30 ± 0.17, 2.17 ± 0.46 and 4.23 ± 0.84 μg/l for methoxychlor. In endrin exposure tests the caddisfly and the stonefly were used; the bullhead was used for vertebrate comparison. Methoxychlor exposures were carried out on the caddisfly, the stonefly, the isopod *Asellu communis*, and the snail *Physa integra*. Test animals were observed daily for toxic or behavioral effects, and at the end of the test, residues were determined in surviving animals by gas chromatography. Endrin was found to be more toxic than methoxychlor. Within 4 days, behavioral changes occurred in the caddisfly at 0.07 μg endrin/l and in the stonefly at 0.15 μg endrin/l. The LC50 values were 0.03 μg/l for the caddisfly 0.07 μg/l for the stonefly and 0.10 μg/l for the bullhead. During methoxychlor exposure, the isopod *A. communis* was the most sensitive, with behavioral changes occurring during the first 4 days and with a 28-day LC50 of 0.42 μg/l. The LC50 for the caddisfly decreased from 2.9 μg/l at 14 days to 1.3 μg/l at 28 days. No mortality occurred among the stoneflies or snails at the concentrations tested, but behavioral changes were seen at 2.2 μg/l for the stonefly. Stoneflies that survived accumulated methoxychlor and endrin to concentrations 350 to 1150 fold greater than water concentrations. Snail concentration factors ranged from 5000 to 8600.

80-2562. Mikhopadhyay, P. K.; Dehadrai, P. V. (Cent. Inland Fish. Res. Inst., Indian Counc. Agric. Res., Barrackpore 743-101, West Bengal, India) **Biochemical changes in the air-breathing catfish *Clarias batrachus* (Linn) exposed to malathion.** *Environ. Pollut.* 22(2): 149-158; 1980 (33 references).

Air-breathing catfish *(Clarias batrachus)* were exposed to low levels of malathion (0.05 ppm) for 40 days, after which one group of fish was injected with 10 μCi of l-lysine-U-^{14}C. Fish were sacrificed after 40 min, and ^{14}C-lysine incorporation into liver protein was determined by liquid scintillation counting. Changes in hematological parameters, alterations in the hepatic and serum levels of certain biochemical constitutents, activities of arylesterases in liver, gill and serum, and tissue accumulation of malathion were also determined. Reduced incorporation of 1-lysine-U-^{14}C into liver protein was noted, and it could not be recouped even at higher dietary protein levels. There was an increase in total and differential leukocyte count and in serum glucose and free amino acid levels. The results indicated a decrease in erythroyctes, hemoglobin and hematocrit values, and in liver glycogen. No changes in erythrocyte sedimentation rate, hepatic protein or nucleic acids were found. A chromatogram is presented showing the analysis of malathion in various tissues. Accumulation occurred mostly in the gills at the rate of 70.6 μg/g wet tissue. Quantities in the liver and kidney were unmeasurable on the chromatogram scale.

80-2563. Singh, H.; Singh, T. P. (Dep. Zool., Fish Endocrinol. Lab., Banaras Hindu Univ., Varanasi 221005, India) **Thyroid activity and TSH potency of the pituitary gland and blood serum in response to Cythion and Hexadrin treatment in the freshwater catfish, *Heteropneustes fossilis* (Bloch).** *Environ. Res.* 22(1): 184-189; 1980 (19 references).

Effects of Cythion (organophosphorus compound, malathion) and Hexadrin (organochlorine compound, endrin) on thyroidal activity and thyrotrophic potency of the pituitary gland and blood serum were studied in *Heteropneustes fossilis*. Reduced thyroid activity as judged by thyroidal ^{131}I uptake and CR (conversion ratio of PB ^{131}I in blood serum in relation to total serum ^{131}I uptake) was noticed within 4 wk of Cythion and Hexadrin treatment at safe concentration (SC) and sublethal (SL) dose levels. Cythion at SL and Hexadrin at both concentrations reduced pituitary and serum TSH content. Pituitary TSH levels were unaffected by Cythion and SC dose although serum TSH was effectively brought down. These pesticides probably reduce TSH output which in turn affects thyroid activity or they may directly act on thyroid gland to suppress thyroidal activity on the one hand and interfere with TSH secretion on the other. (Author abstract by permission of Academic Press)

80-2564. Singh, H.; Singh, T. P. (Dep. Zool., Fish Endocrinol. Lab., Banaras Hindu Univ., Varanasi 221005, India) **Effect of two pesticides on ovarian ^{32}P uptake and gonadotrophin concentration during different phases on annual reproductive cycle in the freshwater catfish, *Heteropneustes fossilis* (Bloch).** *Environ. Res.* 22(1): 190-200; 1980 (12 references).

Ovarian ^{32}P uptake and gonadotrophic contents of the pituitary gland and blood serum after 4 wk of treatment with Cythion (malathion) and Hexadrin (endrin) at safe or sublethal concentrations were measured in *Heteropneustes fossilis* during 5 different phases of the annual reproductive cycle. Gradual reduction in the ovarian ^{32}P uptake as well as in gonadotrophin level started from the preparatory phase and was more pronounced and significant during pre-spawning and spawning phases. In early post-spawning period the changes in ovarian ^{32}P uptake and gonadotrophin content were less than those observed in the previous 2 phases after Cythion treatment but similar to those observed after Hexadrin administration. Values in the late post-spawning period were similar to those observed in preparatory phase. These pesticides seem to interfere with gonadotrophin secretion and their action on ovary with resultant decrease in ovarian activity during all phases of the annual reproductive cycle in *H. fossilis*. (Author abstract by permission of Academic Press)

80-2565. Fasco, M. J.; Cashin, M. J. (New York State Dep. Health, Albany, NY 12201) ***R* and *S* warfarin inhibition of vitamin K_1 2,3-epoxide reductase (K-ER) activity in the rat.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(6): 1892; 1980.

S warfarin in approximately 5 times more active than *R* warfarin as an anticoagulant in Wistar rats. K-ER, an enzyme of the vitamin K_1, vitamin K_1 2,3-epoxide metabolic cycle involved in the γ-carboxylation of coagulation factor glutamate, is strongly inhibited by the warfarin enantiomers. *S* warfarin addition to hepatic microsomes of untreated rats inhibits dithiothreitol ($DTTH_2$) supported K-ER activity only slightly more than does *R* warfarin. Increasing $DTTH_2$ concentration (1-10 m*M*) partially overcomes *R* and *S* warfarin inhibition of K-ER. Prolonged dialysis (24 hr) also partially restores K-ER activity and the susceptibility to $DTTH_2$ concentration remains. At equivalent plasma concentration, *S* warfarin inhibits K-ER more effectively than *R* warfarin. Rates of recovery of K-ER activity are much slower than rates of enantiomer clearance from plasma. One hr after *R* or *S* warfarin administration, inhibition of K-ER is susceptible to $DTTH_2$ concentration and thus resembles warfarin addition to microsomes. However, at times exceeding 8 hr after administration, neither increasing $DTTH_2$ concentration nor dialysis restores K-ER activity. We conclude that warfarin inhibition of K-ER occurs at 2 sites, and that addition of warfarin to microsomes does not completely duplicate the *in vivo* situation. (Author abstract by permission)

80-2566. Mukku, V. R.; Ireland, J. S.; Robinson, A. K.; Stancel, G. M. (Dep. Pharmacol., Med. Sch., Univ. Texas, Houston, TX 77025) **The *in vitro* induction of a specific estrogen inducible protein by *o,p'*-DDT.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 39(6): 1906; 1980 (1 reference).

Previous studies have shown that *in vivo* administration of *o,p'*-DDT to female rats produces estrogenic responses. This study was performed to determine if DDT could also produce an estrogenic response from the rat uterus in a completely *in vitro* system. For this purpose the *in vitro* induction of a specific estrogen inducible protein (the IP) was investigated as previously described. *o,p'*-DDT induces the synthesis of IP *in vitro*, and this response is blocked by actinomycin D and cycloheximide. IP induction is maximum after an *in vitro* exposure of the tissue to *o,p'*-DDT for 1 hr. This response is produced by *o,p'*-DDT, which binds to the uterine estrogen receptor, but not by *p,p'*-DDT, which does not bind to the receptor. The mol wt of the IP induced by DDT is 43,000 based on SDS gel electrophoresis, which is identical to that of the IP induced by estradiol. A half-maximal response is obtained with 30 μM. The maximum response to *o,p'*-DDT is only 50-60% of that seen with estradiol. The effects of the hormone and the pesticide are not additive, however, and DDT does not reduce the *in vitro* response to estradiol. The *in vivo* administration of *o,p'*-DDT also stimulates IP production. *o,p'*-DDT thus has estrogenic activity *in vitro* as well as *in vivo*. (Author abstract by permission)

80-2567. Wilson, R.; Lovejoy, F. H., Jr.; Jaeger, R. J.; Landrigan, P. L. (Enteric Dis. Branch, Bact. Dis. Div., Bur. Epidemiol., Cent. Dis. Control, Atlanta, GA 30333) **Acute phosphine poisoning aboard a grain freighter. Epidemiologic, clinical and pathoiogical findings.** *J. Am. Med. Assoc.* 244(2): 148-150; 1980 (16 references).

Two children and 29 of 31 crew members aboard a grain freighter became acutely ill after inhaling the toxic fumigant phosphine (hydrogen phosphide); one child died. Predominant symptoms were headache, fatigue, nausea, vomiting, cough and shortness of breath. Abnormal physical findings included jaundice, aresthesias, ataxia, intention tremor and diplopia. Focal myocardial infiltration with necrosis, pulmonary edema, and widespread small-vessel injury were found at postmortem examination of the dead child. The surviving child showed ECG and echocardiographic evidence of myocardial injury and transient elevation of the MB fraction of serum creatinine phosphokinase. Illness was significantly associated with living or working amidships or on the forward deck areas of the vessel. Phosphine gas was found to have escaped from the holds through a cable housing located near the midships ventillation intake and around hatch covers on the forward deck. The outbreak illustrates the hazards associated with shipboard fumigation. (Author abstract by permission)

80-2568. De Beer, J.; Heyndrickx, A.; Van Peteghem, C.; Piette, M.; Timperman, J. (Inst. Hyg. Epidemiol., B-1050 Brussels, Belgium) **Suicidal poisoning by MCPA and parathion.** *J. Anal. Toxicol.* 4(2): 91-98; 1980 (36 references).

The post-mortem examination of a 65-yr-old woman who committed suicide by ingesting an MCPA solution and a parathion formulation is described. The women had swallowed Agroxyl containing the sodium and potassium salts of MCPA (250 g/l). Due to her short survival period and the dark coloring of the stomach contents upon autopsy, the intake of parathion was also suspected. Gross internal and histological examinations were inconclusive with respect to the exact cause of death. Toxicological examinations were carried out on samples of blood, urine, gastro-intestinal content, liver, kidney and muscle using gas chromatography. Derivatization procedures were utilized for MCPA detection. Identification of MCPA and parathion was confirmed by GC-MS. The cause of death was attributed to parathion. However, since the women had also ingested MCPA, the early distribution of this herbicide in the body was able to be determined.

80-2569. Dittrich, V.; Luetkemeier, N.; Voss, G. (Agro Div., Ciba-Geigy Ltd., Basel, Switzerland) **OP-resistance in *Spodoptera littoralis*: inheritance, larval and imaginal expression, and consequences for control.** *J. Econ. Entomol.* 73(3): 356-362; 1980 (6 references).

Larval resistance (R) against monocrotophos in an R-strain of *Spodoptera littoralis* (Boisduval) is characterized by a 250X difference of LD50 compared to a sensitive strain (S). Toxicological experiments with larvae of reciprocal crosses between S and R were inconclusive as to the R character. Analysis of P, F_1 and F_2 generations of moths by monocrotophos injections demonstrated the operation of a sex-linked gene for resistance. Biochemical tests of AChE activity and resistance to inhibition by 5 ppm monocrotophos showed that the sex-linked gene in R did not control an insensitive AChE. The biochemical mechanism which it controls could not be identified. The present and earlier results point to R in *S. littoralis* as being due mainly to the very efficient MFO system in larvae. An insensitive AChE, offering limited protection for the imago, may have evolved as a specific response of the adult stage to selection pressure occurring as a side effect of larvae control in the field. A sex-linked R-gene as demonstrated here also may be specific for the imaginal phase. Moths and eggs seem to be less capable to muster such an efficient protective mechanism as the MFO-system in larvae. Therefore, they are suggested to be the preferred targets for future control of important lepidopteran pests. (Author abstract by permission)

80-2570. Singh, H.; Singh, T. P. (Dep. Zool., Fish Endocrinol. Lab., Banaras Hindu Univ., Varanasi 221005, India) **Short-term effect of two pesticides on the survival, ovarian ^{32}P uptake and gonadotrophic potency in a freshwater catfish, *Heteropneustus fossilis* (Bloch).** *J. Endocrinol.* 85(2): 193-199; 1980 (26 references).

In 96 hr toxicity tests, the effects of the organophosphate pesticide malathion (Cythion) and the

organochloride pesticide endrin (Hexadrin) on the freshwater fish *Heteropneustes fossilis* were studied. Adult gravid females were used in all experiments. In survival tests, the concentrations required to kill half the fish in a batch [LC(I)50] and the highest concentration of pesticide which did not produce any lethal effect in 96 hr (SC) were determined. Hexadrin, with LC(I)50 of 0.02 ppm and SC of 0.006 ppm, was more lethal than Cythion [LC(I)50 of 38 ppm and SC of 9 ppm]. In another set of experiments, fish exposed to LC(I)50 and SC dosages of both pesticides received a tracer dose of ^{32}P. Scintillation counting carried out on ovarian tissue indicated reduced ovarian ^{32}P uptake due to both dosages of pesticide. In addition, both Hexadrin and Cythion caused decreased levels of total gonadotrophin in the pituitary gland and serum. Ovarian ^{32}P uptake could be increased during pesticide exposure by the addition of LH or homologous pituitary extract. It is suggested that the pesticides tested retard gonadotrophin secretion, which reduces ovarian ^{32}P uptake, at the doses tested. They do not interfere with the effects of exogenous LH or pituitary extract.

80-2571. Rathbone, M. P.; Vickers, J. D.; Ganagarajah, M.; Brown, J. A.; Logan, D. M. (Dep. Neurosci., Med. Cent., McMaster Univ., Hamilton, Ontario L8S 4J9, Canada) **Neural regulation of cholinesterase in newt skeletal muscle. I. Distribution and characterization of the enzyme species.** *J. Exp. Zool.* 210(3): 435-450; 1979 (50 references).

The properties and distribution within newt muscles of 6 forms of acetylcholinesterase (AChE) were examined as a preliminary step in an investigation of the nature and mechanism of the neurotrophic regulation of AChE in newts. Separate homogenates were prepared of the triceps muscles dissected from the forelimb and peripheral nerves dissected from the forelimb. Blood samples were drawn and centrifuged to separate the red blood cells. Fractionation of AChE in the tissue samples was by velocity sedimentation in sucrose gradients or by polyacrylamide gel electrophoresis. Radiometric assays of AChE were carried out, along with colorimetric determination of AChE and butyryl cholinesterase activity. Six forms of AChE were separated, with sedimentation coefficients of 16.5S, 12.8S, 9.8S, 7S, 5.5S and 3.7S. These were identified as AChE by their ability to hydrolyze acetyl-β-methylcholine, but not butyrylthiocholine. The 16.5S form was found in the area containing the motor endplates. The 12.8S form was found in a high proportion at the musculotendinous junction. Since the 2.7S and 5.5S forms were soluble in Tris buffer, they are probably located in the cytoplasm. The 9.8S form requires 1 *M* NaCl for solubilization, indicating that it is associated with an osmotic shock-resistant intracellular compartment, possibly the sacrotubular system. The 7S form has not been thoroughly characterized.

80-2572. Rathbone, M. P.; Vickers, J. D.; Ganagarajah, M.; Brown, J. A.; Logan, D. M. (Dep. Neurosci., Med. Cent., McMaster Univ., Hamilton, Ontario L8S 4J9, Canada) **Neural regulation of cholinesterase in newt skeletal muscle. II. The effects of denervation and of culture *in vitro*.** *J. Exp. Zool.* 210(3): 451-462; 1979 (59 references).

In vivo and *in vitro* studies were carried out to determine whether the changes in AChE activity that occur during culture of newt triceps muscles are analogous to changes that occur after degeneration *in vivo*. For the denervation studies spinal nerves 3, 4 and 5 of newts *(Notophthalmus viridescens)* were cut at the level of the brachial plexus, and triceps muscles removed from each forelimb. In *in vitro* studies, whole triceps muscles were cultured with and without dorsal root ganglia from an adult newt. For 11 studies, total muscle AChE was assayed by velocity sedimentation on sucrose density gradients. In the *in vivo* tests the AChE activity in triceps muscles fell to approximately 60% of that in innervated muscles 2 wk after denervation. However, changes in AChE activity in organ cultures were similar in rate and extent to those that occurred after denervation *in vivo*. Denervation and organ culture had similar effects on the individual AChE species, with rapid loss of the forms with sedimentation coefficients of 16.5S and 12.8S, a transient 00ncrease in 9.8S, no change in 5.5S, and a slight decline in 3.7S. Culture of the muscles with dorsal root ganglia prevented both loss of total AChE activity and the alterations in molecular forms of AChE. This innervation-like effect is apparently mediated by a diffusible factor, since the same effect was achieved by ganglia separated from the muscles by Millipore filter.

80-2573. Rathbone, M.; Vickers, J. D.; Logan, D. M. (Dep. Neurosci., Med. Cent., McMaster Univ., Hamilton, Ontario L8S 4J9, Canada) **Neural regulation of cholinesterase in newt skeletal muscle. III. Regulation *in vitro* by proteins from chick embryo brains.** *J. Exp. Zool.* 210(3): 463-472; 1979 (35 references).

Studies were designed to characterize and purify the putative neurotrophic proteins and to determine whether they have a physiological role in mediating neurotrophic effects *in vivo*. Triceps muscle of newts were cultured with sensory ganglia of newts, sympathetic ganglia from chicken embryos, or regenerating ventral nerve roots from cats. Total muscle AChE was then determined, and separation of AChE species was carried out by velocity sedimentation in sucrose density gradient. Previous studies have found that the newt triceps muscles show characteristic changes in various AChE species after denervation *in vivo* and in organ cultures. The current results indicate that chick embryo brain extracts maintained total AChE activity and prevented the changes in forms of AChE. The active factor(s) were found to be heat labile, trypsin sensitive but RNA insensitive, and with an apparent molecular wt of $< 20{,}000$ daltons. It is concluded that the chick brain extracts is a plentiful source of neurotrophically active material, and a factor can be purified from it for examination of the physiological role of putative neurotrophic factor.

80-2574. Carricaburu, P.; Lacroix, R.; Lacroix, J. (UER Pharm., Lab. Pharm. Chim., F-37032 Tours, France) **Etude comparative par electroretinographie des effets oculaires de pesticides chez la souris. [Comparison study by electro-retinography of ocular effects of pesticides in the mouse.]** *J. Pharm. Belg.* 34(5): 308-311; 1979 (7 references) (French).

Male and female strain NMRI albino Swiss mice were injected ip with Aramite, parathion, carbaryl, chlorophenotane (DDT) or lindane. Pesticide doses were 4 mg for carbaryl, 15-150 mg for the organochlorine pesticides, and 40-160 mg for Aramite. All pesticides studied exhibited toxicity toward the retinal cells of the eyes. The action of the chemicals occurred at different levels (photoreceptors, synapses, bipolar and ganglion cells) causing variations in the electro-retinographic responses.

80-2575. Raizada, R. B.; Misra, P.; Saxena, I.; Datta, K. K.; Dikshith, T. S. S. (Ind. Toxicol. Res. Cent., Lucknow, India) **Weak estrogenic activity of lindane in rats.** *J. Toxicol. Environ. Health* 6(3): 483-492; 1980 (19 references).

Female albino rats (ovariectomized 15 days before the start of the experiment) were given lindane po in oil at 20 mg/kg/day, estradiol dipropionate at 1 μg/rat/day ip, or both compounds. Glycogen content of the uterus, cervix and vagina was significantly increased in rats receiving lindane alone, but no change in weight of these organs was noted. Rats treated with estradiol dipropionate or both chemicals exhibited highly significant increases in the weights and in the glycogen content of the reproductive tissues. No pathological changes in the reproductive organs were caused by lindane. Uterus, cervix and vagina were stimulated by estradiol dipropionate treatment. Lindane plus estradiol dipropionate caused structural changes in the rat tissues. All treatments caused significant increases in RBC. White blood cells were not influenced by these treatments. It is suggested that the weak estrogenic effect exhibited by lindane on the reproductive organs of these rats may have been due to rapid excretion of the chemical from the reproductive system.

80-2576. Mallipudi, N. M.; Talcott, R. E.; Ketterman, A.; Fukuto, T. R. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA) **Properties and inhibition of rat malathion carboxylesterases.** *J. Toxicol. Environ. Health* 6(3): 585-596; 1980 (24 references).

Enzymatic hydrolysis of malathion was studied using 2 esterase fractions, identified as fraction A and fraction B, isolated from rat liver microsomes. Fraction A and B were found to be 13- and 18-fold more effective, respectively, in hydrolyzing malathion than the microsomal fraction. The fractions were not distinguishable kinetically. However, one fraction contained at least one electrophoretic species which was not present in the other. Fraction B was about twice the molecular weight of fraction A. The presence of multiple species of carboxylesterases in mammalian liver microsomes was indicated. The results suggest the presence of at least 2 different esterases in either esterase fraction A or esterase fraction B; an esterase which hydrolyzes malathion mainly to α monoacid and is strongly sensitive to inhibition by O,S,S,-trimethyl phosphorodithioate and another esterase that hydrolyzes malathion mainly to β monoacid and is weakly sensitive to the trimethyl ester. Isomalathion was also found to be a potential substrate for the purified rat liver esterase fractions as well as an inhibitor. Preliminary experiments showed that a 100-fold greater concentration of isomalathion was needed for it to serve as a substrate than as an inhibitor. It is suggested that the overall potency of isomalathion in inhibiting both rat liver and rat serum carboxylesterase is the major contributor to malathion potentiation.

80-2577. Melancon, M. J.; Lech, J. J. (Dep. Pharmacol. & Toxicol., Med. Coll. Wisconsin, Milwaukee, WI) **Uptake, metabolism, and elimination of ^{14}C-labeled 1,2,4-trichlorobenzene in rainbow trout and carp.** *J. Toxicol. Environ. Health* 6(3): 645-658; 1980 (17 references).

Fingerling rainbow trout were exposed to ^{14}C labeled 1,2,4-TCB. Short term exposure studies were conducted with fish placed in 32 ℓ of 0.018 mg/l TCB (9091 dpm/μg). Fish were sacrificed 2, 4 and 8 hr after exposure. Long term exposure was accomplished by use of a continuous flow delivery system with TCB at 1481 dpm/μg delivered in acetone with a water flow of 8 l/hr. TCB which accumulated in muscle, blood and liver of the trout during the 8 hr exposure was eliminated rapidly when the fish were placed in fresh water. After 2 days of elimination, blood contained less than 0.5% of its original level of TCB. After 35 days of exposure, the loss of the chemical from blood was also very rapid. No ^{14}C was detected in blood by 24 hr after the trout were placed in fresh water. Elimination from muscle and liver was rapid during the first few days in fresh water, but then slowed. After 2 days the liver contained 6% of the originally accumulated level, and muscle contained just over 10%. The rate of chemical release from trout was not found to be related to exposure time.

80-2578. Volpenhein, R. A.; Webb, D. R.; Jandacek, R. J. (Proctor & Gamble, Miami Valley Labs., Cincinnati, OH) **Effect of a nonabsorbable lipid, sucrose polyester, on the absorption of DDT by the rat.** *J. Toxicol. Environ. Health* 6(3): 679-683; 1980 (10 references).

Male Sprague-Dawley rats were fed both sucrose polyester (SPE) and soybean oil. Some rats were fed soybean oil containing 30 ppm ^{14}C labeled DDT. The emulsion fed to the rats consisted of 22% sucrose, 20% nonfat milk solids, 2% USP salt mix XIV, 36% water and 20% fat. Other rats were fed emulsion diets containing 33% water and 23% fat, with the fat containing 15 ppm DDT. Dietary

SPE reduced absorption and tissue deposition of dietary DDT. When SPE replaced half of the dietary soybean oil fed to rats the absorption of DDT was reduced by two thirds. It is suggested that the SPE caused dissolution of the lipophile in the unabsorbable oil phase followed by excretion of DDT in the feces. The results suggest that SPE can reduce the absorption of other undesirable dietary lipophiles which are either chronically absorbed trace contaminants of food or acutely ingested lipophilic poisons.

80-2579. Spehar, R. L.; Carlson, R. W.; Lemke, A. E.; Mount, D. I.; Pickering, Q. H.; Snarski, V. M. (Environ. Res. Lab., Duluth, MN) **Effects of pollution on freshwater fish.** *J. Water Pollut. Control Fed.* 52(6): 1703-1768; 1980 (401 references).

A review of the literature on the effects of pollution on freshwater fish is presented. LC50 values for about 300 compounds including organics, pesticides, heavy metals and inorganics for many groups of fish are included. The toxicity studies in which these LC50 values were determined, as well as other studies on sublethal effects and mixtures of toxicants, are reviewed. A section on industrial and municipal effluents discusses chlorine, wastewater, pulp and paper. Finally, a discussion is presented in which physical factors, such as land development, are related to the biochemical and biological alterations in aquatic habitats.

80-2580. Waller, W. T.; Lanza, G. R. (Univ. Texas Dallas, Richardson, TX) **Substrate-associated microfauna.** *J. Water Pollut. Control Fed.* 52(6): 1768-1774; 1980 (44 references).

Some aspects of aquatic studies using artificial substrates are reviewed. Various methods for the collection, handling and analysis of substrate associated microfauna are discussed. Studies on the ecology of organisms in this type of sample are presented. Toxicity data on various organisms are also reported, including results on polynuclear aromatic hydrocarbons, aluminum, nickel, DDT, and the impact of wood waste and wastewater sludge. Normal and regenerating planaria were used to study the effects of DDT on regeneration, asexual fission, and the rate of absorption and metabolism. It was determined that 0.15 ppm DDT reduced asexual fission of planaria, and 0.4 ppm affected regeneration. Planaria converted DDT to DDE and DDD (TDE), and DDE appears to be the major metabolite.

80-2581. Flickinger, E. L.; King, K. A.; Stout, W. F.; Mohn, M. M. (Gulf Coast Field Stn., Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Victoria, TX 77901) **Wildlife hazards from Furadan 3G applications to rice in Texas.** *J. Wildl. Manage.* 44(1): 190-197; 1980 (10 references).

Mortality of birds, fish, frogs, crayfish, earthworms, and nontarget insects occurred in rice fields after treatments of Furadan (carbofuran) 3G granules in 3 Texas counties in 1970 and 1973-75. Three western sandpipers *(Ereunetes mauri)*, 1 pectoral sandpiper *(Erolia melanotos)*, and 2 red-winged blackbirds *(Agelaius phoeniceus)* were found dead or moribund between 17 and 24 hr after treatment. Cricket frogs *(Acris crepitans blanchardi)* were intoxicated 15 min post-treatment, and mosquito fish *(Gambusia affinis)* showed effects 1 hr post-treatment. Mortality of mosquito fish, Gulf menhaden *(Brevoortia patronus)*, Atlantic croaker *(Micropogon undulatus)*, and European carp *(Cyprinus carpio)* usually occurred between 24 and 28 hr after treatment. Mortality of frogs, crayfish, and nontarget insects generally occurred in rice field water between 1 and 45 hr after treatment. Mortality of earthworms in soil persisted for 52 hr. As a replacement for aldrin in Texas rice fields, Furadan 3G appeared to cause less mortality of birds than aldrin, but Furadan 3G was toxic to birds, fish, and invertebrates. (Author abstract by permission)

80-2582. Zil'bermints, I. V.; Iakovleva, I. N. (All-Union Res. Inst. Phytopathol., USSR) **O rezistentnosti oranzhereinoi belokrylki k fosfororganicheskim pestitsidam. [Resistance of green-house whitefly to organophosphorus pesticide.]** *Khim. Sel'sk. Khoz.* 18(4): 32-33; 1980 (4 references) (Russian).

The rate of resistance to organophosphorus pesticides (OPP) in a population of green-house whitefly was determined. Natural populations of whitefly highly resistant to carbophos (malathion) were discovered. It was found that a population with 70-fold resistance to carbophos showed increased resistance to Aktellik (LC50 of 0.00066%, compared with 0.000022% for laboratory sensitive population), indicative of cross-resistance induced by carbophos.

80-2583. Cheah, M. L.; Avault, J. W., Jr.; Graves, J. B. (Sch. For. & Wildl. Manage., Louisiana State Univ., Baton Rouge, LA) **Some effects of rice pesticides on crayfish.** *La. Agric.* 23(2): 8, 9, 11; 1980.

Toxicity tests were carried out to determine the effects of 13 chemicals commonly used in rice production on crayfish. The chemicals tested included 5 insecticides [methyl parathion, metalkamate (bufencarb), carbaryl, carbofuran, and malthion], 3 herbicides (propanil, molinate and 2,4-D) and 5 fungicides [Arasan 70-S Red (thiram), Vitavax-R (carboxin), benomyl, Kocide SD (copper hydroxide) and captan]. Immature red swamp crayfish were used to determine the 96 hr LC50 values for each pesticide. In general, the insecticides were most toxic, and fungicides least toxic. Except for malathion (with a 96 hr LC50 of 50 mg/1), all insecticides were acutely toxic, with 96 hr LC50 values of < 0.5 mg/l. The herbicides propanil and molinate were moderately toxic (96 hr LC50s of 7.9

and 14.0 mg/l, respectively). 2,4-D showed very low acute toxicity (96 hr LC50 of 1389 mg/l). Except for Arasan 70-S Red, the fungicides were not very toxic to crayfish.

80-2584. Omer, S. M.; Georghiou, G. P.; Irving, S. N. (Dep. Crop Prot., Fac. Agric., Univ. Khartoum, Shambat, Sudan) **DDT/pyrethroid resistance inter-relationships in *Anopheles stephensi*.** *Mosq. News* 40(2): 200-209; 1980 (21 references).

The interrelationships of DDT and pyrethroid resistance in mosquitos was studied. Strains of DDT and pyrethroid susceptible and resistant *Anopheles stephensi* were used. Larvae and adults from various crosses were assayed for the 2 test compounds. Cross-resistance to *trans*-permethrin and *cis*-permethrin was induced after 6 generations of exposure to DDT. The synergists DMC (chlorfenethol) and piperonyl butoxide in combination with DDT caused the highest rate of cross-resistance. Studies on neuromuscular responses of treated larvae indicate that the mode of action of resistance is related to changes in the nervous system resulting in lower sensitivity to the toxic action of the pyrethroid.

80-2585. Miltenburger, H. G.; Reimann, R. (Inst. Zool., Tech. Univ., D-6100 Darmstadt, BRD) **How safe are viral pesticides?** *Mutat. Res.* 74(3): 169; 1980.

The application of insect pathogenic nuclear polyhedrosis viruses (NPV) for controlling pest insects is authorized in several countries. This is an important step towards reducing the amount of chemical pesticides that disturb heavily the ecosystems. So far all studies have demonstrated that these naturally occurring agents do not produce physiological alterations in non-target organisms. Neither toxic nor pathogenic effects have been found in mammals and man. However, genetical data are still rather preliminary. We have treated Chinese hamster and mice with *Autographa californica* (alfalfa looper) – NPV with total doses of more than 10^9 polyhedral inclusion bodies (PIB) and more than 10^8 TCID 50s of non-occluded virions (NOV). The PIB and NOV were given together with the food, by stomach tube and injected ip. The experiments were run from 24 hr up to 90 days. In addition, permanent cell lines from Chinese hamster, mouse and Indian muntjak were inoculated with NOV doses of 10-5000 TCID 50s per cell. The SCE rates were increased neither in bone-marrow cells of the animals nor in the cell cultures, though EM analysis showed NOVs in the cytoplasm of the mammalian cells 24 hr after inoculation. [Abstract 4 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2586. Massoud, A.; Aly, A.; Shafik, H. (Dep. Public Health, Ain Shams Univ., Abbassia, Cairo, Egypt) **Mutagenicity and carcinogenicity of cyclohexanone.** *Mutat. Res.* 74(3): 174; 1980.

Cyclohexanone is the main solvent used in liquid pesticides in Egypt. Cyclohexanone was tested through forward mutation using *Bacillus subtilis*, and backward mutation using Ames' test. Different concentrations of the chemical were used for different incubation periods. The results showed severe effects on *B. subtilis* survivals. Mutants obtained were requiring different amino acids, and the leucine requiring mutants had the maximum percentage of all. Functional mutants were obtained for leucine, methionine, phenylalanine, uracil and tryptophan, also a number of revertants appeared. Ames's test was held on the histidine-requiring *S. typhimurium:* TA1535, TA1537, TA1538, TA98 and TA100. TA98 showed the greatest response in producing a large number of revertants. Also it proved to be a potent carcinogen by comparing with nitrosoguanidine. [Abstract 14 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2587. Degraeve, N.; Gilot-Delhalle, J.; Moutschen, J. Moutschen-Dahmen, M.; Golizzi, A.; Chollet, M.; Houbrechts, N. (Dep. Genet., Univ. Liege, B-4000 Leige, Belgium) **Comparison of the mutagenic activity of organophosphorus insecticides in mouse and in the yeast *Schizosaccharomyces pombe*.** *Mutat. Res.* 74(3): 201-202; 1980.

The mutagenic activity of 11 organophosphorus insecticides (azinphos methyl, azinphos ethyl, malathion, dimethoate, methyl parathion, parathion, fenitrothion, bromophos, bromophos ethyl, dichlorvos and trichlorfon) has been comparatively tested in the mouse (dominant lethal mutations) and in the yeast *S. pombe* (forward mutations ad 6). In the mouse, no compound increased the percentages of dead implants. After single ip injections of azinphos ethyl (1 mg/kg) and bromophos (1 g/kg), the numbers of preimplantation losses were increased during the first wk after treatment. Similar results were obtained with dichlorvos (10 mg/kg) and trichlorfon (100 mg/kg), respectively, 3 and 2 wk after treatment. In the yeast, dichlorvos (0.3 g/100 ml/hr) and trichlorfon (3 g/100 ml/hr) alone gave a strong mutagenic effect after treatment without microsomes. This effect highly decreased but remained significant after treatment with microsomal fraction. These latter results could explain the absence of dominant lethal mutations in mice. [Abstract 65 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2588. Nehez, M.; Paldy, A.; Selypes, A.; Berencsi, Gy. (Inst. Hyg. & Epidemiol., Szeged Univ. Med., Szeged, Hungary) **Experiments on the mutagenic effect of two pesticides, DNOC and trifluralin.** *Mutat. Res.* 74(3): 202-203; 1980 (8 references).

Two pesticides, Krezonit E containing 50% DNOC (4,6-dinitro-*o*- cresol) and OLITREF containing 26% trifluralin content (2,6-dinitro-*N*, *N*-dipropyl-4- trifluoromethylalamine), both belonging to the nitrophenol group, were tested in our institute. Examination of the human lymphocyte chromosomes after incubating the culture with Krezonit E *in vitro* was made. Experiments carried out with both pesticides included the examination of the chromosomes of mouse bone-marrow cells *in vivo* and the examination of gametic mutation in gametes (spermatocyte test), with dominant lethality or the examination of F_1 embryonic chromosomes. In all test systems both pesticides proved to be mutagenic. [Abstract 67 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2589. Andersen, M.; Binderup, M. L.; Kiel, P.; Larsen, H. (Dep. Microbiol., R. Danich Sch. Pharm., DK-2100 Copenhagen, Denmark) **The use of microorganisms in mutagenicity testing of preservatives.** *Mutat. Res.* 74(3): 205; 1980.

The problems in mutagenicity testing of fungicidal and bacterial agents in microbial test systems are well known. It is not possible to test concentrations higher than the MIC value. Presented are some examples of how results from microbial mutagenicity tests have been used to show that bactericidal agents have no carcinogenic potential. Interpretation of results from mutagenicity testing of preservatives in the *Salmonella* mutagenicity test, using spot tests, plate-incorporation assays, and mutagenesis tests in liquid will be discussed. [Abstract 73 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2590. Bronzetti, G.; Lee, I.; Zeiger, E.; Malling, H.; Suzuki (Lab. Mutagenesi & Diff., CNR, Pisa, Italy) **Genetic effects of TCDD *in vitro* and *in vivo* using D7 strain of *S. cerevisiae*.** *Mutat. Res.* 74(3): 206-207; 1980.

TCDD is the most toxic compound that man has synthesized. It is not manufactured for commercial use but is a possible contaminant in pesticides, in particular 2,4,5-T. The amount of contamination depends on how the pyrolysis is controlled. TCDD is very toxic, induces enzymatic alteration, is fetotoxic and teratogenic. In carcinogenicity there is not an open literature and in mutagenicity there are contradictory results. We performed experiments *in vitro* with and without S_{10} fraction and *in vivo* (intrasanguineous host mediated assay) using D7 strain of *S. cerisiae* where we can value 3 genetic effects: mitotic gene conversion, reverse mutation and mitotic cross-over. In these experiments, for our purpose, we considered 2 genetic effects: mitotic gene conversion and reverse mutation. TCDD *in vitro* with S_{10} fraction induces both genetic effects while without S_{10} fraction we did not obtain any induction. *In vivo* tests using male Swiss albino mice with only one shoot of 25 μg/kg TCDD in corn oil solution display the effects only 20 days after the administration. [Abstract 75 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2591. Matijesevic, Z.; Erceg, Z.; Denic, R.; Bacun, V.; Alacevic, M. (Fac. Technol., Zabreb, Yugoslavia) **Mutagenicity of herbicide cyanazine: plant activation bioassay.** *Mutat. Res.* 74(3): 212; 1980.

Genetic activity of the widely used *s*-triazine herbicide cyanazine as well as its possible plant metabolism products were examined on *Salmonella typhimurium* strains as indicator organisms. Plant activation bioassay was performed by treating growing maize plants with different concentrations (10-60 ppm) of herbicide and exposing the test organism to the extracts of leaves from 3-leaf stage plants. The mutagenic effects of the extracts from treated and control plants were compared. Mutagenicity testing of plant extracts and cyanazine alone was performed by standard plate incorporation method and modified suspension method, using 2 *Salmonella* strains (TA98 and TA1535). Cyanazine increased the mutation rate, which seemed to be further increased when the extracts of treated plants were used. This indicates that the products of metabolism in plants are even more mutagenic than cyanazine alone. [Abstract 86 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2592. Solt, A. K.; Neale, S. (Courtland Inst. Biochem., Med. Sch., Middlesex Hosp., London W1P 7PN, England) **Induction of bacterial mutations by mutagenic metabolites produced in intact mice.** *Mutat. Res.* 74(3): 214; 1980.

In this assay system complement-resistant *Escherichia coli* were recovered up to 4 days after iv injection into mice treated with single or multiple doses of the test compound. Following their recovery the bacteria were screened for forward mutations in antibiotic-resistance markers. Sensitivity of this method was demonstrated using the carcinogen dimethylnitrosamine. A dose of 0.05 mg/kg dimethylnitrosamine could be detected and, at higher concentrations, a positive dose-response curve was obtained. These results and results obtained following multiple daily doses of this compound are discussed in relation to its known carcinogenic potency and the induction of DNA repair mechanisms. Results with the antineoplastic drug Natulan and the herbicide atrazine have been used to demonstrate the importance of intact animals as the source of mammalian metabolic activation. Both compounds induce chromosome damage in mice but give negative results in bacterial mutation tests using liver homogenate metabolic activation. Administration of either Natulan or, by oral intubation, atrazine to mice was shown to induce a positive mutation response in *E. coli* in the method described here. [Abstract 90 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2593. Soska, J.; Novecek, L.; Lojka, J. (Inst. Biophys., CSAV, Brno, Czechoslovakia) **The mutagenic activities and structure of some 5-nitrofurans and quinoxaline-1,4- dioxides.** *Mutat. Res.* 74(3): 214-215; 1980.

The mutagenic activity of some nitrofuran derivatives was studied with respect to the polarity and to conjugated double bonds in the substituent. When studying quinoxaline-1,4- dioxide and its 2-formyl derivatives, the results obtained were consistent with the idea that higher electron densities in the Q-nucleus resulted in lower mutagenic activation. Additional methylation in position 3 resulted in lower mutagenic activity than that of the corresponding non-methylated compounds (e.g. 3-methylated: quinoxaline-1,4-dioxide, carbadox, 2-cyanquinoxaline-1,4-dioxide). The 3-methyl derivatives displayed a shift in the NMR spectra of the methine proton in the side chain to higher values of the field. The mutagenic activities were determined using the Ames' tests. [Abstract 91 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2594. Matijasevic, Z.; Eger, M.; Bacun, V.; Rupnik, O.; Alacevic, M. (Fac. Technol., Zabreb, Yugoslavia) **Mutagenicity of herbicide cyanazine: host-mediated assay.** *Mutat. Res.* 74(3): 216-217; 1980.

The *s*-triazine herbicide cyanazine (2-(4-chloro-6-ethylamino- *s*-triazin-2-yl- amino)-2-methyl- propionitrile) was previously shown to induce chromosomal aberrations in root-tip cells of *Vicia faba*, dominant lethals in *Drosophila melanogaster* and reversion at the *Waxy* locus of *Zea mays* micro-gametophytes. Examined were the genetic effects on the yeast cells of *Saccharomyces cerevisiae* D4 *in vitro* and in host-mediated assay using Swiss albino mice. Animals were treated by single oral doses of herbicide (200 and 1000 ppm) and ip injection of yeast cell suspension. Cyanazine was observed to induce gene conversion at the *ade 2* and *trp 5* loci of *S. cerevisiae in vitro*, but the genetic effect on yeast cells was considerably increased by host metabolism. [Abstract 95 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2595. Benigni, R.; Dogliotti, E. (Ist. Super. Sanit., Rome, Italy) **UDS studies on selected environmental chemicals.** *Mutat. Res.* 74(3): 217; 1980.

Ten selected environmental chemicals were assayed for the induction of unscheduled DNA synthesis, by autoradiography, in EUE cells. The chemicals analyzed are the following: three benzotrifluorides, (4-chlorobenzotrifluoride, 3-nitro-4-chlorobenzotrifluoride and 3,5-dinitro-4-chlorobenzotrifluoride), which are intermediates in the industrial production of the herbicide trifluralin and are pollutants of the water-bearing stratum in the area of Vicenza (Italy). The other chemicals tested were the herbicides [aminotriazole, (amitrole), di-allate, triallate, sulfallate] and insecticides (dichlorvos, trichlorfon and tetrachlorvinphos) previously investigated in our laboratory with *in vitro* short-term test based on induction of specific genetic events (gene mutations in *Salmonella typhimurium*, *Streptomyces coelicolor* and *Aspergillus nidulans*; mitotic crossing-over and non-disjunction in *A. nidulans*). With the exception of the 3,5-dinitro-4-chlorobenzotrifluoride all the chemicals tested turned out to be positive in the UDS test. [Abstract 97 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2596. Becker, K.; Schoeneich, J. (Zent. Inst. Genet. & Kulturpflanzenforsch., Acad. Wisdenschaft DDR, DDR-4325 Gatersleben, DDR) **Dominant lethal test with trichlorphon in male mice.** *Mutat. Res.* 74(3): 224; 1980.

Two groups of 20 male NMRI mice were injected ip by a single dose of 4.5×10^{-2} *M* and 3×10^{-2} *M* trichlorfon, respectively. Each treated male was mated with 2 untreated females weekly for 8 successive weeks. Females were killed on days 13-17 post-conception and their uteri were examined for pre- and post-implantation loss by counting corpora lutea, implantations, and live and dead implants. According to the investigations, trichlorfon had no mutagenic effect, in terms of the induction of dominant lethal mutations, on germ cells of male NMRI mice in any stage of spermatogenesis. [Abstract 111 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2597. Vachkova-Petrova, R. (Inst. Nutr., Sofia, Bulgaria) **Mutagenicity study of the organophosphate pyrazophos in rats.** *Mutat. Res.* 74(3): 236-237; 1980.

The cytogenic analysis of rat bone marrow was applied after acute (doses of 0.05-0.5 LD50), subacute (doses of 0.05-0.20 LD50) and chronic oral exposure to the organophosphorus fungicide pyrazophos. In the chronic study (6 mo) 3 doses were tested (0.005, 0.01 and 0.05 LD50). Analysis was carried out at the end of the first, third and sixth mo. In the course of cytogenetic investigations (acute, subacute and chronic) no significant increase of incidence of aberrations or aneuploidy was detected when comparing the values obtained with the corresponding data in the control groups (*t* test, $p > 0.05$). A certain increase of cells with aberrations was observed in the higher doses, more than twice in the 0.20 LD50 dose during the acute and subacute study and about twice in the 0.5 LD50 dose at the end of the chronic study. This tendency is supposed to have an accidental character, but the possibility that it might be the result of non-specific toxic lesions cannot be excluded. No definite mutagenic effect of pyrazophos was found. [Abstract 135 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2598. Hool, G.; Mueller, D. (Ciba-Geigy Ltd., Basel, Switzerland) **Sister-chromatid exchange: studies with various mutagens and comparison with other test systems using bone marrow of Chinese hamster.** *Mutat. Res.* 74(3): 247-248; 1980 (2 references).

The aim of the studies was to compare the sensitivity of the sister-chromatid exchange (SCE) test to that of the nucleus anomaly test (NAT). In the SCE test the animals received one application of the substance and were sacrificed 24 hr later. The fluorochrome plus Giemsa technique was used. Two female and 2 male animals per control and dose groups were examined. Per animal, 25 differently stained metaphases of the second cell cycle with BUdR were analyzed for the number of SCEs. In the NAT 2 applications were given at an interval of 24 hr. At 24 hr after the second application the animals were sacrificed. The studies were carried out with 5 substances. The minimum concentrations leading to an effect in the SCE test were: with vincristine, 120 μg/kg; with thiotepa, 150 μg/kg; with cyclophosphameide, 500 μg/kg; with mitomycin C, 12 mg/kg; and with MNNG, 7 mg/kg. In the NAT the following doses caused an effect: with vincristine, 7.5 μg/kg; with thiotepa, 150 μg/kg; with cyclophosphamide, 4 mg/kg; with mitomycin C, 0.75 mg/kg; and with MNNG, 28 mg/kg. In two cases the SEC test, and in two other instances the NAT, proved to be more sensitive. Further investigations would be necessary to confirm the complementary characteristics of these test systems. [Abstract 157 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2599. Benigni, R.; Dogliotti, E. (Ist. Super. Sanit., Rome, Italy) **UDS studies on selected environmental chemicals.** *Mutat. Res.* 74(3): 248-249; 1980.

In order to compare the results of tests based on specific genetic events with those of an aspecific one, 6 selected environmental chemicals were assayed for the induction of unscheduled DNA synthesis, by autoradiography, in EUE cells. The chemicals analyzed are the following: the herbicides aminotriazole (amitrole), diallate, triallate and sulfallate and the insecticides dichlorvos and trichlorfon, previously investigated in our laboratory, by *in vitro* short-term tests based on induction of specific genetic events (gene mutation in *Salmonella typhimurium*, *Streptomyces coelicolor* and *Aspergillus nidulans*; mitotic crossing-over and non-disjunction in *A. nidulans*). All of them turned out to be positive in the UDS test, showing a good agreement with the previous results, with the exception of aminotriazole (negative in Ames test and 8-azaguanine resistance in *A. nidulans*). The data stress the importance of the availability of an adequate set of tests, including an aspecific one, for the detection of the genotoxicity of chemicals. [Abstract 159 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2600. Loprieno, N.; Barale, R.; Mariani, S.; Presciuttini, S.; Rossi, A. M.; Sbrana, I.; Zaccaro, L.; Abbondandolo, A.; Bonatti, S. (Lab. Genet., Univ. Pisa, Pisa, Italy) **Results of mutagenicity tests on the herbicide atrazine.** *Mutat. Res.* 74(3): 250-250; 1980.

Atrazine, a herbicide of wide use in agriculture, has been reported to be metabolized to *N*-dealkyl and hydroxylated derivatives by plant biotransforming reactions and by mammalian enzymatic systems. Oxidation, hydroxylation, and *N*-dealkylation of atrazine have been shown to occur in soil. Moreover, atrazine *in vitro* can react with nitrite to give rise to *N*-nitroso derivatives; the nitrosation, however, does not occur in plants or in the animal. Atrazine has been shown to produce in plants a mutagenic metabolite. A series of investigations developed with the aim to assess the potential mutagenic activity of atrazine *in vitro* on *Salmonella typhimurium* (reverse mutation), *Schizosaccharomyces pombe* (forward mutation), *Saccharomyces cerevisiae* (mitotic gene conversion), Chinese hamster cells V79 line (forward mutation), human cells EUE line (unscheduled DNA synthesis), and *in vivo* on mouse bone-marrow cells (chromosome aberration) and host-mediated assay, but using 2 different metabolic activation systems (liver homogenate and plant homogenate), have demonstrated that this herbicide is activated by plant enzymes to produce a mutagenic metabolite for *S. pombe* and Chinese hamster V79, and is able to induce UDS in human cells. The compound, moreover, is positive in the host-mediated assay (mouse, yeast injected intrasanguineously) and for the induction of chromosome aberrations in the bone-marrow cells of the mouse after a single dose of 1 g/kg and 2 g/kg, respectively. Other recent studies developed in Europe by several laboratories confirm the present results, thus indicating that atrazine might represent a genetic hazard for man. [Abstract 161 of the 9th annu. meet. Eur. Environ. Mutagen Soc.] (Author abstract by permission)

80-2601. Rosen, J. D.; Segall, Y.; Casida, J. E. (Dep. Food Sci., Cook Coll. Rutgers Univ., New Brunswick, NJ 08903) **Mutagenic potency of haloacroleins and related compounds.** *Mutat. Res.* 78(2): 113-119; 1980 (28 references).

2-Chloroacrolein, the ultimate mutagen formed on metabolism of the carcinogenic herbicides diallate and sulfallate, and its 2-bromo-, 2,3-dichloro- and 2,3,3-trichloro- analogs are much more potent mutagens in the Ames *Salmonella typhimurium* strain TA100 assay than any other aldehydes examined previously or in this study. Polymer formation on reaction of deoxyadenosine with the difunctional 2-chloroacrolein probably involves crosslinking via Schiff base formation at the carbonyl group and Michael addition at the double bond. (Author abstract by permission)

80-2602. Gatehouse, D. (Pathol. Div., Glaxo Group Res. Ltd., Ware, Hertfordshire, England) **Mutagenicity of 1,2 ring-fused acenaphthenes against *S. typhimurium* TA1537 and TA1538: structure-activity relationships.** *Mutat. Res.* 78(2): 121-135; 1980 (28 references).

A number of 1,2-ring-fused acenaphthenes, together with the parent compounds acenaphthene and acenaphthylene, were evaluated for mutagenicity, using the Pour-Plate Technique with *Salmonella typhimurium* strains TA1538 and TA1537. Although acenaphthene and acenaphthylene were non-mutagenic, all the 1,2-ring fused acenaphthenes were found to be indirect frameshift mutagens in strain TA1537. The chemical nature of the 1,2-fused ring did not appear to be important for mutagenic activity against TA1536, however its nature did affect the mutagenesis of strain TA1538. Only acenaphthenes fused with a pyrimidine or pyrazine ring were capable of mutating the hisD 3052 locus of TA1538. Methyl substitution at various sites on the molecule modified the mutagenic activity against TA1537, and indicated the formation of an electrophilic species (epoxide) at the 2,3-position of the acenaphthene nucleus. The incorporation of a competitive substrate for ring hydroxylation (naphthalene) reduced the mutagenic effect of acenaphthopyrimidine against TA1537 and confirmed this assumption. However, naphthalene did not reduce the mutagenic effect of the compound against TA1538, indicating the possible formation of a second metabolite by an alternative enzymic pathway. (Author abstract by permission, abridged)

80-2603. Tezuka, H.; Ando, N.; Suzuki, R.; Terahata, M.; Moriya, M.; Shirasu, Y. (Toxicol. Div., Inst. Environ. Toxicol., Tokyo 187, Japan) **Sister-chromatid exchanges and chromosomal aberrations in cultured chinese hamster cells treated with pesticides positive in microbial reversion assays.** *Mutat. Res.* 78(2): 177-191; 1980 (42 references).

The induction of sister-chromatid exchanges (SCEs), chromosomal aberrations and polyploids was investigated in cultured Chinese hamster cells treated with pesticides or a related compound positive in microbial reversion assays. The chemicals tested were captan, captafol, 1,2-dibromoethane (EDB, ethylene dibromide), 1,2-dibromo-3-chloropropane (DBCP), 5-nitro-1-naphthonitrile (NNN), *p*-dimethylaminobenzenediazo sodium sulfonate (DAPA, fenaminosulf), 2-hydrazinoethanol (HEH), vamidothion, dichlorvos (DDVP), *N*-nitroso-ethylenethiourea (*N*-nitroso-ETU), and 2,4-dinitriphenyl thiocyanate (NBT). A significant and dose-dependent increase in the frequency of SECs and chromosomal aberrations was observed in the cell cultures treated with captan, captafol, EDB, DBCP, HEH, DDVP, vamidothion, DAPA or *N*-nitroso-ETU. Neither NNN nor NBT induced SCEs or chromsomal aberrations. Treatment with EDB, NNN, vamidothion, DDVP, *N*-nitroso-ETU or NBT produced a significant increase in the frequency of polyploid cells, whereas the other agents did not. When compared with results from microbial reversion assays, a close correlation was observed between the ability to induce SCEs or chromosomal aberrations and the mutagenic potency in bacteria (r: 0.71-0.84). (Author abstract by permission)

80-2604. Deneke, S. M.; Fanburg, B. L.* (Dep. Med., Pulm. Div., N. Engl. Med. Cent., Tufts Univ., Boston, MA 02111) **Normobaric oxygen toxicity of the lung.** *N. Engl. J. Med.* 303(2): 76-86; 1980 (113 references).

Current research on the mechanisms of oxygen toxicity is reviewed. The pathology and biochemistry of oxygen toxicity are discussed. Evidence from bacterial, animal and perfused-organ models is presented. Other topics discussed are tolerance to oxygen, and effects of chemicals, drugs, metabolism and nutrition on oxygen toxicity. It is noted that the herbicide paraquat increases the cyanide-resistant respiration of bacteria by short-circuiting the electron-transport chain and producing a superoxide radical rather than water as a reduction product. It also induces superoxide dismutase (SOD) activity in bacteria and enhances oxygen toxicity in rats. Diethyldithiocarbamate (DDC), an inhibitor of SOD, increases oxygen damage in cells *in vitro* and accelerates oxygen toxicity in rats. Along with disulfiram, diethyldithiocarbamate also increases oxygen toxicity in mammals by decreasing the activities of protective enzymes.

80-2605. Kobayashi, S.; Ito, R. (Sch. Pharmacol., Fac. Med., Toho Univ. Tokyo, Japan) **[A simple method for calculating synergism, and the detection of synergistic action of pesticide mixtures on acute toxicity to mouse.]** *Nippon Yakurigaku Zasshi (Folia Pharmacol. Jpn.)* 76(1): 27P-28P; 1980 (Japanese).

Methods for detection of chemical synergism are discussed and a method for unifying them is presented. A formula for determining the presence or absence of synergism in mixtures of 2 insecticides having anticholinesterase activity is presented. The degree of synergism is equal to the reciprocal of the product of the LD50 of the mixture and the sum of the ratios of the amount of pesticide in the mixture to the LD50 of the pesticide. Results of acute oral toxicity tests on mice with a mixture of EPN and malathion indicate unambiguous synergism at a degree of $\sim$ 2.8. However, synergism changed depending on the ratio of the 2 insecticides. No synergism was observed in percutaneous toxicity tests on carp or killifish by EPN - malathion mixtures. No synergism was observed in acute toxicity tests of 15 combinations of any 2 organophosphorus and carbamate insecticides, or organophosphorus fungicides.

80-2606. Katsuoka, M.; Yamanaka, K.; Terada, M.; Hayashi, E. (Sch. Pharmacol., Shizuoka Coll. Pharm., Shizuoka, Japan) **[Comparison of the action of organophosphorus compounds and that of physostigmin on the extirpated ileum of guinea pig.]** *Nippon Yakurigaku Zasshi (Folia Pharmacol. Jpn.)* 76(4): 97P-98P; 1980 (1 reference) (Japanese).

Contraction of the extirpated ileum of a guinea pig due to applications of dipropyl-*p*-methylthiophenylphosphate (PP) for a long period and the change of

acetylcholinesterase reactivity under application of PP were examined while comparing with the effect of physostigmin (Phy). Ileum contraction was recorded on kymograph paper. The application of PP at 10^{-5} *M* for a long period resulted in transient and intermittent contraction after 15-20 min. The degree of contraction increased with time, and after 1 hr of application of PP, the tonic phase of contraction by acetylcholine at 1.7×10^{-6} *M* was suppressed. Application of Phy at 7.2×10^{-6} *M* produced a strong phasic contraction and a tonic contraction just after the application, and contraction due to acetylcholine was suppressed. The contraction due to PP was suppressed 100% by atropine (1.4×10^{-7} *M*) and by tetrodotoxin (3.1×10^{-7} *M*), 90% by strychnine (1.7×10^{-5} *M*) and 60% by hexamethonium (10^{-5} *M*). These antagonistic agents reduced the tonic suppression of acetylcholine under application of PP. However, contraction due to Phy was suppressed only by atropine. The reaction of ileum to PP and Phy differed greatly. According to the results of the reactivity to acetylcholine and antagonistic agents, it is concluded that the immanent acetylcholine intervenes between the application of PP and the contraction, and contraction by Phy is due to the direct action to the unstriated muscles as well as the immanent acetylcholine.

80-2607. Tsuda, S.; Miyaoka, S.; Iwasaki, M.; Shirasu, Y. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan) **[Pharmacodynamic analysis of the acute toxicity-enhancing effect of *o-sec*-butylphenyl *N*-methylcarbamate in animals pretreated with fenitrothion.]** *Nippon Yakurigaku Zasshi (Folia Pharmacol. Jpn.)* 76(4): 148P; 1980 (Japanese).

Results of pharmacodynamic analyses on the enhancement of the acute toxicity response to Bassa (BPMC; *o-sec*-butylphenyl *N*-methylcarbamate) in mice pre-treated with fenitrothion are reported. Bassa toxicity was enhanced by administrations given after 1000 ppm fenitrothion in feed has been consumed for 1 wk. Toxic symptoms observed were characteristic of anticholinesterase poisoning. Blood concentrations of Bassa were determined in mice following 3 different dosage regimens. Group I mice received Bassa po at 100 mg/kg and then iv at 13 mg/kg. Group II mice were pre-treated with fenitrothion and were then given Bassa at 20 mg/kg po followed by 8 mg/kg iv. Group III animals were given Bassa, 20 mg/kg po and 8 mg/kg iv, without pre-treatment with fenitrothion. Groups I and II had nearly identical Bassa blood levels, while group III had much lower levels. Pre-treatment with fenitrothion was presumed to have affected the metabolic processes which eliminate Bassa from the blood. These processes are assumed to play an important role in the synergistic effects of organophosphorus and *N*-methylcarbamate insecticides.

80-2608. Howard, F. M.; Hill, J. M. (Dep. Obstet. & Gynecol., Fitzsimons Med. Cent., US Army, Denver, CO 80240) **Drugs in pregnancy.** *Obstet. Gynecol. Surv.* 34(9): 643-653; 1979 (67 references).

The effects of drugs on each trimester of pregnancy are reviewed. Congenital anomalies are apparent in 25-50% of fetuses who were exposed to warfarin in the first trimester. Warfarin embryopathy is described and the symptoms include: hypoplastic noses; bone abnormalities, particularly chondrodysplasia punctata; broad short hands; short distal phalanges; eye problems including optic atrophy, cataracts, microphthalmia, hypertelorism; and mental retardation. It is concluded that the drug must be avoided in the first trimester. Warfarin use during the third trimester is associated with increased perinatal mortality.

80-2609. Amin-Zaki, L.; Majeed, M. A.; Elhassani, S. B.; Clarkson, T. W.; Greenwood, M. R.; Doherty, R. A. (Dep. Pediat., Med. Coll., Univ. Baghdad, Baghdad, Iraq) **Prenatal methylmercury poisoning.** *Obstet. Gynecol. Surv.* 35(1): 32-34; 1980.

Thirty-two infants, known to have been prenatally exposed to methylmercury fungicide in Iraq, have been repeatedly evaluated during a 5-yr period. The severity of poisoning in mothers correlated with peak mercury concentrations in hair. The initial exposure for 13 infants was during the first trimester, for 7 during the second, and for 12 during the third. All except 3 received additional doses from breast milk. A wide range of mercury concentrations was found in infant blood samples collected within 2 mo of delivery, from 42 to 422 ng mercury/ml blood. Progressive microcephaly with diminished rate of head growth was noted in 8 cases. No other congenital malformations were noted. Delayed mental development, cerebral palsy, motor delay and hypertonic reflexes persisted until the exposed children were at least 5-yr-old.

80-2610. Kerkenaar, A.; Barug, D.; Sijpesteijn, A. K. (Inst. Org. Chem., TNO, Utrecht, The Netherlands) **On the antifungal mode of action of tridemorph.** *Pestic. Biochem. Physiol.* 12(3): 195-204; 1979 (31 references).

A series of studies was performed to elucidate the antifungal mode of action of the systemic fungicide tridemorph. Toxicity was tested against fungal and bacterial isolates, and incorporation of (^{14}C)phenylalanine into protein, (^{14}C)uridine into RNA and DNA, and (^{14}C)acetate into lipid was studied in *Ustilago maydis*. Tridemorph was active against nearly all taxonomic groups of fungi and against gram-positive bacteria, but not against gram-negative bacteria. Treated sporidia of *U. maydis* appeared swollen, multicellular and sometimes branched. Protein and RNA synthesis were slightly inhibited, DNA synthesis strongly inhibited, and lipid synthesis first inhibited but later stimulated. Treated cells showed a higher content of free fatty acids. Tridemorph also inhibited sterol biosynthesis. The results suggest a similarity between the mode of action of tridemorph and that of known inhibitors of sterol biosynthesis.

80-2611. Patil, T. N.; Koch, R. B. (Dep. Biochem., Mississippi State Univ., Mississippi State, MI 39762) **Differential inhibition responses caused by DDT on oligomycin sensitive Mg^{2+} ATPase activity: nature of the requirements for DDT sensitivity.** *Pestic. Biochem. Physiol.* 12(3): 205-215; 1979 (43 references).

The inhibition of oligomycin-sensitive (OS) Mg^{2+}-ATPase by DDT was studied. Previous work has shown that when OS-ATPase was inhibited by DDT, its active component (F_1, a hydrophilic component) was not affected. Mitochondrial preparations were made from pig heart, rat heart and housefly thorax, and methods are given for the preparation of F_1, F_1-depleted particles, F_1 and oligomycin sensitivity-conferring proteins (OSCP)-depleted particles, OSCP, and phospholipid-depleted particles. A combined approach of reconstitution and substitution methods was carried out. DDT sensitivity was conferred to F_1 from pig heart mitochondrial preparations when it was bound to F_0 from the same preparation. F_1 from housefly thorax was able to bind F_0 from pig heart, and this combination showed sensitivity similar to that of the original F_1-F_0 combination from pig heart mitochondria. However, ATPase activity was insensitive to DDT when F_1 from pig heart mitochondria was incorporated into F_0 depleted in OSCP from the same source. DDT sensitivity was restored by the addition of OSCP. ATPase activity was decreased by depletion of phospholipids from submitochondrial membrane preparations, but DDT sensitivity was restored by the addition of dioleyl or soybean phosphatidyl choline. It is suggested that OSCO and phospholipid are essential for DDT sensitivity, and that DDT acts on F_1 in association with one or more membrane components.

80-2612. Sudershan, P.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois Chicago Circle, Chicago, IL 60680) **Metabolic and elimination products of ^{14}C photodieldrin from bluegill fish.** *Pestic. Biochem. Physiol.* 12(3): 216-223; 1979 (31 references).

The metabolic fate of photodieldrin (PD, the major photoconversion product of dieldrin) in fish was studied using the bluegill *(Lepomis macrochirus).* Fish were exposed to 20 ppb (^{14}C)PD for 48 hr, then transferred to clean water. Water and fish were examined for elimination of radioactivity by liquid scintillation spectrophotometry for up to 5 wk. Metabolites were extracted from whole fish and from water and analyzed by gas-liquid chromatography. PD was absorbed rapidly by the fish, with 70% of the initial radioactivity disappearing in 6 hr. Following transfer to clean water, 50% of the absorbed radioactivity was eliminated in 3 wk. Approximately 27% of the eliminated radioactivity was due to unaltered photodieldrin, with the remainder consisting of at least 11 metabolites in free and conjugated form. The major excretory product was photodieldrin ketone (PDK). Examination of whole fish extracts showed 4 metabolites (major metabolite PDK) in addition to about 90% of the unmetabolized PD. The results suggest that PD may be metabolized in fish by the hepatic microsomal enzymes as has been reported in mammals and insects.

80-2613. Gabliks, J.; Utz, C. (Dep. Biol., Northeastern Univ., Boston, MA 02115) **DDT and inflammatory responses. 1. Influenza infection in mice fed DDT.** *Pestic. Biochem. Physiol.* 12(3): 257-263; 1979 (11 references).

Female albino CD-1 mice were used in studies to determine the effects of DDT on the inflammatory response. The mice were fed casein diets containing 100 and 200 ppm DDT for 20 days, followed by intranasal infection with mouse adapted influenza virus A_2 strain. Severity of infection was determined by mortality, average day of death, magnitude of lung edema, and quantity of virus in the lung. Histamine levels were determined in lung tissue. The DDT-fed mice did not show any sign of DDT intoxication or growth impairment, but did develop a more severe disease following infection with the influenza virus. There was no effect of DDT on viral replication in the lungs, but inflammatory lung edema and mortality rates increased and lung histamine levels decreased (by 30% in control, by 57% in 100 ppm DDT, and by 69% on 200 ppm DDT). It is suggested that DDT residue stored in tissues can affect inflammatory response induced by infectious agents.

80-2614. Gabliks, J.; McLean, S. (Dep. Biol., Northeastern Univ., Boston, MA 02115) **DDT and inflammatory responses: 2. Bacterial endotoxin induced pulmonary oedema in mice and rats.** *Pestic. Biochem. Physiol.* 12(3): 264-268; 1979 (15 references).

Female CD-1 mice and female CD rats were used to determine the acute and chronic effects of DDT on the inflammatory lung edema induced by intranasal instillation of *Escherichia coli* endotoxin. In acute tests mice were given ip injections of 20 mg DDT/kg 2 and 20 hr prior to endotoxin administration. The animals were found to be tolerant of the endotoxin. However, the endotoxin reaction was only partially inhibited when DDT was administered after the endotoxin. It is concluded that pretreatment with DDT depleted the lung histamine stores, thus preventing the endotoxin-initiated inflammation mediated by histamine. In chronic tests, rats were fed 150 ppm DDT in their diet for 36 days prior to endotoxin administration. In this case, the inflammation was increased and accelerated. It is suggested that long-term exposure to DDT leads to increased synthetic capacity of histamine or increased levels of stored histamine as an adaptive response.

80-2615. Askari, E. M.; Gabliks, J. (Dep. Biol., Northeastern Univ. Boston, MA 02115) **DDT and inflammatory responses. 3. Release of histamine from mast cells exposed to DDT.** *Pestic. Biochem. Physiol.* 12(3): 269-272; 1979 (14 references).

Experiments were designed to test the hypothesis that histamine is released by mast cells due to the direct action of DDT. Mast cell-rich mesentery tissue obtained from guinea pigs was incubated *in vitro* with 20 μg DDT/ml for various periods up to 2 hr. At the end of the incubation period, histamine was analyzed in both tissue and incubation fluid by a spectrofluorometric histamine assay. Incubation with DDT showed a biphasic effect with an initial drop in histamine content in mesenteries followed by a relative increase in tissue-bound histamine. The histamine content decreased to 31% of the original content within 45 min, and then increased to 113% after 2 hr. It was concluded that DDT stimulates the resynthesis of histamine in the mast cells, since the amount of histamine released into the medium during the incubation period was twice the original amount of histamine in the tissue.

80-2616. Seifert, J.; Casida, J. E. (Pestic. Chem. & Toxicol. Lab., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Inhibition and reactivation of chicken kynurenine formamidase: *in vitro* studies with organophosphates, *N*-alkylcarbamates, and phenylmethanesulfonyl fluoride.** *Pestic. Biochem. Physiol.* 12(3): 273-279; 1979 (21 references).

In studies designed to elucidate the mechanism of avian teratogenesis induced by organophosphorus and methylcarbamate insecticides, effects on chicken liver kynurenine formamidase (KFase) were assessed: Teratogenesis has been shown to be associated with lowered NAD levels attributable to *in ovo* inhibition of KFase in the yolk sac membrane or embryo liver. KFase was purified, then carbaryl, phenylmethanesulfonyl fluoride, or one of several organophosphorous insecticides (diazinon, dicrotophos, monocrotophos, TEPP and PSCP) was added, and the kinetics of KFase inhibition determined. Inhibition of KFase proceeded according to pseudo-first order reaction kinetics. The parameters of *in vitro* inhibition kinetics did not correlate with the teratogenic potency of various organophosphates and *N*-alkylcarbamates. The inhibited enzyme was found to be quite resistant to activation. It is concluded that teratogenic potency cannot be evaluated solely on the basis of *in vitro* experiments, since marked abnormalities only result following prolonged *in ovo* KFase inhibition and block of NAD biosynthesis.

80-2617. Sarin, K.; Rathi, R. N. (Dep. Zool., Univ. Rajasthan, Jaipur, India) **Biochemical changes induced by thimet (phorate) in the kidney and testes of Indian desert gerbil, *Meriones hurrianae* (Jerdon).** *Pesticides* 14(1): 16-17; 1980 (8 references).

Thirty adult male Indian desert gerbils received a single oral dose of 4 mg/kg thimet (phorate) in 0.5 ml olive oil. A second group served as controls. Animals were autopsied at 12 hr, and 1, 3, 5, 7, 14, and 28 days after treatment. Alkaline and acid phosphatase activities decreased significantly in the kidney, while ATPase significantly increased. In the testes the alkaline and acid phosphatases were increased while ATPase decreased significantly. However, an initial rise was noted in the ATPase activity for up to 12 hr.

80-2618. Das, B. K.; Sarker, A.; Chaudhuri, P. (Dep. Chem., North Bengal Univ., West Bengal, Pakistan) **Investigation of some organophosphorus compounds having pesticidal activity. IV. Insecticidal, toxicological, anticholinesterase and hydrolytic properties of tris (*p*-nitrophenyl) phosphorothionate and phosphate.** *Pesticides* 14(1): 18-21; 1980 (9 references).

Groups of 10 cockroaches, *Periplaneta americana* (Linn.), were exposed to different doses of tris (*p-nitrophenyl*) phosphorothionate and tris (*p-nitrophenyl*) phosphate in dry sugar bait. In subcutaneous toxicity tests white albino male rats received injections of phosphorothionate and phosphate dissolved in acetone. Data on the anticholinesterase activity of these chemicals in human blood is also reported. Roaches died with swollen abdomens. The phosphate was more toxic than the phosphorothionate. In white rats the symptoms at 20 mg/kg of the thiono compound toxicity included a decrease of spontaneous motor activity 30-60 min after treatment, anorexia and recovery within 3-4 days. After oxon-compound exposure a decrease in spontaneous motor activity was noted in 5 min, motor ataxia within 10-20 min, irregular respiration, and death within 24 hr. Tests with human blood samples suggest that the phosphate had higher anticholinesterase activity than did the phosphorothionate.

80-2619. Saler, R. S.; Gangawane, L. V. (Bot. Dep., Inst. Sci., Aurangabad, India) **Tolerance of target and non-target spermosphere microfungi of groundnut to fungicides.** *Pesticides* 14(1): 22-24; 1980 (6 references).

Groundnut seeds were sown in earthenware pots with garden soil. Germinated, but not emerged, seeds were selected for study. Equal volumes of 2-fold Martin's rose bengal streptomycin agar and Waksman's acid agar medium and 2-fold concentrations of 8 fungicides were applied to the germinated seeds. Fungicides studied included Topsin-M (thiophanate-methyl), Bavistin (carbendazim), Brassicol (quintozene), RH-124 (butrizol), Ceresan (MEMC), Calixin (tridemorph), Dithane M-45 (mancozeb), and Difolatan (captafol). The media for the seedlings had final concentrations of 10, 30, 50, 80, 100, 500, 1000, and 1500 ppm (AI) fungicide. Fungal populations were reduced in both the spermosphere and the soil with increased fungicide concentrations. Fungi tolerated Topsin-M, Brassicol, Bavistin, and RH-124 up to 1500 ppm. Calixin, Difolatan, Ceresan and Dithane M-45 were only tolerated to the 80 ppm level. Fifty-two different species of fungi were tabulated during this study. Variations were noted in the tolerance limits of *Rhizocotonia solani* and

Sclerotium rolfsii to the fungicides used. Tolerance limits of most non-target organisms were very close to those of target organisms and it is suggested that control of pathogens using fungicides may affect saprophytes in the spermosphere of groundnut.

80-2620. Jarczok, K.; Krawczyk, M.; Holowiecki, J.; Kusnierczyk-Sasor, J.; Rudzka, E. (Int. Med. Clin I, Inst. Int. Med. Silesian Acad. Med., Katowicach, Poland) **Ostra skaza maloplytkowa po ekspozycji na preparat Muchozol extra. [Acute thrombocytopenic purpura following exposure to the insecticide preparation Muchozol extra E.]** *Pol. Tyg. Lek.* 35(19): 711-712; 1980 (10 references) (Polish).

A 46-yr-old woman developed acute thrombocytopenia purpura after having been exposed to the pesticide preparation Muchozol extra E for 1 mo, 8 hr/day, in a potato storage facility, in which the pesticide was used daily. The pesticide is a mixture of methoxychlor, pyrethroid, and a synergistic agent. The platelet count dropped to below 1,000/mm^3, the bleeding time was 45 min, and the clotting time was 16 min. Chemotherapy with fenicort, encorton, cyclonamine, epsilon-aminocaproic acid, metanabol, vitamin K, and antibiotics was successful in about 9 days. Methoxychlor is thought to be able to cause platelet breakdown by inhibiting oxidative phosphorylation.

80-2621. August, P. J. (Skin Hosp., Sch. Med., Univ. Manchester, Manchester, England) **Iatrogenic skin disease.** *Practitioner* 224(1343): 471-478; 1980 (6 references).

Adverse skin reactions to various drugs are reviewed. Tender red lesions have been known to develop within 1 wk of an initial loading dose of warfarin used as an oral anticoagulant. Development of the condition includes blistering and necrosis. Spontaneous recoveries have been recorded, but surgical procedures have often been required. Death has occurred in some cases. Ninety per cent of these cases are women. Among these patients obesity is common, and lesions develop in areas of subcutaneous fat deposits. Arterial and venous subcutaneous thrombosis have also been noted.

80-2622. Schrankel, K. R.; Hsia, M. T. S.*; Pounds, J. G. (Russel Labs., Univ. Wisconsin, Madison, WI 53706) **Hepatocellular pathotoxicology of 3,3′,4,4′-tetrachloroazobenzene and 3,3′,4,4′-tetrachloroazoxybenzene in the rodent. I. *In vivo* studies.** *Res. Commun. Chem. Pathol. Pharmacol.* 28(3): 527-540; 1980 (18 references).

Group I male Sprague-Dawley rats received 2 ip injections of 25 mg/kg tetrachloroazoxybenzene (TCAOB) on days 1 and 5. These animals were killed on day 10. Group II Sprague-Dawley animals received 4 daily injections of tetrachloroazobenzene (TCAB) at 25 mg/kg and were sacrificed on day 5. Group III female ICR outbred Swiss albino mice were given 5 daily ip injections TCAB at 20 mg/kg immediately after lactation. Animals were killed on day 6. Histopathological changes noted in these animals included enlargement of the hepatocytes and abundant cytoplasmic vacuoles. Smooth endoplasmic reticulum was greatly proliferated with frequent occurrence of membranous arrays. The hepatic mitotic index was significantly greater than control levels. The occasional appearance of atypical mitotic figures suggests potential genotoxicity of TCAB and TCAOB. Exposure to these 2 chemicals is concluded to be an occupational health hazard.

80-2623. Kojima, A.; Hiraga, K. (Dep. Toxicol., Tokyo Metrop. Res. Lab. Public Health, Tokyo, Japan) **[Mutagenicity of citrus fungicides in the microbial system.]** *Tokyo Toritsu Eisei Kenkyusho Kenkyo Nempo (Annu. Rep. Tokyo Metrop. Res. Lab. Public Health)* 29(2): 83-85; 1978 (12 references) (Japanese).

Recombination assays using 2 strains of *Bacillus subtilis*, H17A and M45T, and mutagenicity tests using *Escherichia coli* B/rWP2 and 2 strains of *Salmonella typhimurium*, TA100 and TA98, were carried out on 5 citrus fungicides, diphenyl (DP; biphenyl), *o*-phenylphenol (OPP), sodium OPP, butyl *p*-hydroxybenzoate (PHBB) and thiabendazole (TBZ). In the recombination assay OPP and sodium-OPP inhibited growth at a concentration of 1 mg/filter paper of both strains of *B. subtilis*. Although the width of growth inhibition showed a difference of 2-3 mm, since the boundary of the inhibited zone was obscure, no difference in growth inhibition could be attributed to OPP in either strain. PHBB also inhibited growth at concentrations higher than 1 mg/filter paper, however, no difference of growth inhibition zones for either strain was observed. DP and TBZ did not show any growth inhibition. In mutagenicity tests with *E. coli*, no increases in revertants were observed with OPP or sodium OPP at concentrations of 1-100 μg/ml. Toxicity was observed at > 100 μg/ml. No increases in the number of revertant colonies were recognized for TBZ, PHBB or DP. In mutagenicity tests with *S. typhimurium* in the presence and absence of the activated metabolism by polychlorobiphenyl and phenobarbital, no increased numbers of revertant colonies were observed with any one of the fungicides tested. None of the 5 fungicides tested was found to be mutagenic under the conditions tested.

80-2624. Yoshida, S.; Masubuchi, M.; Hiraga, K. (Dep. Toxicol., Tokyo Metrop. Res. Lab. Public Health, Tokyo, Japan) **[Cytogenetic studies of antimicrobials on cultured cells.]** *Tokyo Toritsu Eisei Kenkyusho Kenkyo Nempo (Annu. Rep. Tokyo Metrop. Res. Lab. Public Health)* 29(2): 86-88; 1978 (7 references) (Japanese).

Inhibition of proliferation and cytogenetic effects on Chinese hamster CHO-KI ovary cells by *o*-phenylphenol

(OPP), biphenyl (DIP), thiabendazole (TBZ) and butyl *p*-hydroxybenzoate (PHB) were studied. DIP showed the strongest inhibition of replication of the cells at concentrations > 50 μg/ml. OPP, PHB and TBZ showed similar degrees of inhibition at concentrations > 100 μg/ml. DIP at 50 μg/ml was a strong inhibitor of colony formation. There was a clear relationship between concentration and effect. OPP gave similar results. TBZ showed inhibition at 100 μg/ml. PHB showed no inhibition up to 100 μg/ml. DIP was the strongest inhibitor of cell proliferation. Effects of these agents on cell chromosomes were not detected up to 48 hr at concentrations of 25-50 μg OPP/ml, 2.5-25 μg DIP/ml, 5-50 μg TBZ/ml and 25-50 μg PHB/ml. It was concluded that none of the chemicals were mutagenic in the cell line tested.

80-2625. Ogata, A.; Ando, H.; Kubo, Y.; Hiraga, K. (Dep. Toxicol., Tokyo Metrop. Res. Lab. Public Health, Tokyo, Japan) **[Teratological tests of *o*-phenylphenol (OPP) and sodium *o*-phenylphenol (OPP-Na) in mice.]** *Tokyo Toritsu Eisei Kenkyusho Kenkyo Nempo (Annu. Rep. Tokyo Metrop. Res. Lab. Public Health)* 29(2): 89-96; 1978 (6 references) (Japanese).

The teratogenic action of *o*-phenylphenol (OPP) and its sodium salt (sodium-OPP) was investigated using JCL-ICR mice. Chemicals were administered po from day 7 to day 15 of pregnancy at levels of 2100, 1740 and 1450 mg/kg/day (once a day, for 9 consecutive days) of OPP and 400, 200 and 100 mg/kg/day of sodium-OPP. Fetuses were examined for abnormal appearance and skeletal anomalies. Decreased body-wt gain, changes in maternal organ weights, and delayed fetal development were observed. It was concluded that OPP and its sodium salt were not teratogenic.

80-2626. Johnson, M. K. (Med. Res. Counc. Lab., Carshalton, Surrey SM5 4EF, England) **Delayed neurotoxicity induced by organophosphorus compounds – areas of understanding and ignorance.** *Toxicol. Lett.* 5(Sp 1): 2; 1980.

The induction of delayed neurotoxicity in hens by organophosphorus compounds occurs by inhibition of neurotoxic esterase (NTE) and subsequent aging of the inhibited enzyme. Compounds which do not age such as carbamates and phosphinates provide protection against the development of neuropathy when a neurotoxic compound is introduced. In single dose experiments, over 70% inhibition soon after dosing is required by day 10-14 of neuropathy. Spinal cord NTE inhibition is a better indicator of neuropathy than NTE inhibition of the brain. Neuropathy does not occur from daily doses which maintain 45-50% inhibition for 7-10 wk. The structure-activity relationships for inhibition of NTE and AChE are well understood. $I50^{NTE}/I50^{AChE}$ is approximately the same as the neuropathic dose to LD50 ratio. Human NTE is similar to that of hens but less percent inhibiton may be required to cause neuropathy in man. In resistant species, *in vivo* inhibition of NTE does not lead to neuropathy. Events after aging and the fate of inhibited NTE are unknown. The function of NTE in nerve axons has not yet been discovered. Regional and subcellular studies indicate no specialized target of NTE action. DFP has been shown to cause a mild one-sided neuropathy in cats. From these findings it was suggested that the initial events of neuropathy occur in the distal axonal region instead of in the neuronal cell body. [Abstract S.3 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2627. Spooner, J.; Goulding, R. (Author address not given) **Liaison with industry in the provision of essential information for the management of poisoning.** *Toxicol. Lett.* 5(Sp 1): 11; 1980.

In North America, Western Europe and other countries, the function of clinical toxicology units is largely the diagnosis and care of acute cases of drug overdose. Treatment remains mainly conservative and often involves the intensive care facilities. Sometimes specific antidotes are appropriate. An understanding of the kinetics, dynamics and biochemistry of drugs and chemical pesticides are essential. Since many of the drugs are manufactured commercially, clinicians in treating overdose patients must rely on information assembled through industrial pharmacological and toxicological research. The toxicological background of household products and industrial chemicals is even less substantial. Arrangements with trade associations for receiving toxicological information on many products are often helpful. [Abstract S.21 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2628. Murphy, S. D. (Div. Toxicol., Univ. Texas Med. Sch., Houston, TX 77025) **Toxic interactions with dermal exposure to organophosphate insecticides.** *Toxicol. Lett.* 5(Sp 1): 34; 1980.

Certain chemicals have been shown to modify the hepatic metabolism of organic phosphorothionate insecticides thereby changing their acute oral or ip toxicity and anticholinesterase action. Rats pretreated ip or dermally with 125 mg/kg of TOTP (tri-*o*-tolyl phosphate) showed inhibition of 50% of brain ChE (ID50) at 192 mg/kg or 233 mg/kg, respectively. When malathion was given to control rats, it did not inhibit brain ChE, even at doses as high as 1000 mg/kg. TOTP inhibited carboxylesterase activity ChE, even at doses as high as 1000 mg/kg. TOTP inhibited carboxylesterase activity both systemically and dermally whether given ip or dermally. Rats pretreated with phenobarbital under conditions that induce hepatic microsomal oxidases, which are involved in parathion and methyl parathion oxidation, were protected against the acute anticholinesterase action of these two pesticides. In rats pretreated with phenobarbital, ID50 doses of parathion for brain, diaphragm, and plasma ChE were 5.3, 4.4, and 2.3 times greater than for untreated rats when

parathion was given dermally, and 7.5, 6.2, and 2.0 times greater when given orally. Less protection against methyl parathion was observed in phenobarbital-pretreated rats. These findings show that metabolically-based toxic interactions of organophosphorus insecticides are qualitatively the same after dermal as after oral exposure. [Abstract O.37 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2629. Willems, J.; Braeckman, R.; Belpaire, F. (Heymans Inst. Pharmacol., Univ. Gent Med. Sch., Gent, Belgium) **Fate of methyl parathion and parathion in the dog.** *Toxicol. Lett.* 5(Sp 1): 34; 1980.

After iv injection of 1-50 mg/kg of methyl parathion in the dog, serum levels of this insecticide decreased rapidly during the first 2 hr and more slowly thereafter. A mean half-life of 7.2 hr was calculated from a dose of 10 mg/kg. By examining a serum level-time curve, the fate of methyl parathion in different kinetic compartments may be determined. Elimination of 70% of the dose occurs 5 hr after injection. Of the amount remaining in the body, 90% is located in a peripheral compartment. Similar results were found for parathion. Lower serum levels of methyl parathion were obtained after oral administration than were found with iv dosing. The low plasma levels after oral dosing and the high serum clearance values (2.1 l/kg/hr) after iv dosing suggest that methyl parathion is taken up to a great extent by the liver. [Abstract O.38 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2630. Grisk, A.; Moeritz, K. U.; Bleyer, H.; Fermum, R. (Inst. Pharmakol. & Toxikol., Ernst Moritz Arndt Univ., Greifswald, DDR) **Influences on cyclic AMP system by diisopropylfluorophosphate, paraoxon and dimethoate.** *Toxicol. Lett.* 5(Sp 1): 35; 1980.

The toxicity of organophosphates, with respect to time course and intensity, was not correlated to acetylcholinesterase (AChE) inhibition. Dose-dependent actions of organophosphates on cAMP content, adenylate cyclase and proteinkinase activity in various organs of different species were found. DFP (given ip at 1.44 mg/kg) decreased the total cAMP content of rat brains and hearts within 30 min to 30% and 40%, respectively. The activity of adenylate cyclase of the heart and brain particulate fraction was inhibited by DFP and paraoxon (1-100 n*M*) and by dimethoate (1-10 μM). The proteinkinase preparation from bovine coronary artery was inhibited by 100 μM DFP whereas the adenylate cyclase was less sensitive. The inhibition did not effect *in vitro* coronary function. The toxicity of organophosphates is correlated with their potency to inhibit biochemical reactions in the cAMP system. It is suggested therefore that cAMP is involved in the toxicity of the organophosphorus compounds. [Abstract O.39 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2631. Kirsch, D.; Weger, N. (Pharmakol. Inst., Univ. Muenchen, D-8000 Muenchen 2, BRD) **Effects of bispyridinium oximes on impulse transmission and NAD(P)H-fluorescence of the superior cervical ganglion of the rat with and without organophosphate poisoning.** *Toxicol. Lett.* 5(Sp 1): 35; 1980.

The mechanism of the antidotal effects of the bispyridinium oximes HGG12 and HGG42 in organophosphate poisoning were examined by measuring the impulse transmission and NADPH-fluorescence of the superior cervical ganglion. Both oximes inhibited ganglionic transmissions at levels higher than 10 μmol/l. At levels of 75 μmol/l, the potential was reduced by 50%. The onset of the effect was not delayed; it was completely reversible and observable also under fluorescence. A decreased metabolic response and the therapeutic effect of these compounds can be observed in soman poisoning at levels of 30 μmol/l which corresponds to the therapeutic level in beagle dogs. Hexamethonium and atropine improved ganglionic transmission in a manner similar to HGG12 and HGG42. In cholinesterase poisoning, HGG12 and HGG42 act as protectors of cholinergic ganglionic synapses. Fluorescence of NADPH and continuous recording to post-synaptic action potential have given valuable aid in studying the effects of drugs on ganglionic synapses. [Abstract O.40 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2632. Edery, H.; Perry, C. (Sackler Sch. Med., Tel Aviv Univ., Tel Aviv, Israel) **Effects of organophosphate poisons, oximes and cholinolytics on urinary bladder motility.** *Toxicol. Lett.* 5(Sp 1): 36; 1980.

The effects of organophosphates, oximes and cholinolytics on urinary bladder tone and contractions was examined by pelvic nerve stimulation (PNIC) in dogs anesthetized with chloralose. Compounds were injected through catheters in vesical arteries and pressure in the saline-filled urinary bladder was measured. PNIC and tone were increased by 20 μg/kg paraoxon, 1 mg/kg parathion or 20 mg/kg malathion. Both tone and PNIC were reduced and organophosphate action was reversed by 1 mg/kg obidoxime, 2 mg/kg diperoxime, or 5 mg/kg H1-6. Dose-related (5-20 mg/kg) rapid bladder contraction followed by long lasting tone increase occurred after introduction of P_2S. Effects induced by P_2S were not blocked by cholinolytics. Both bladder tone and PNIC were decreased by 50 μg/kg 3-quinuclidinyl- benzilate (QNB) and 200 μg/kg benactizine. It was suggested that the effects of organophosphates have on the bladder are related to their anticholinesterase properties. It was also postulated that the stimulating action of P_2S might occur from a direct action on smooth muscle fibers independent of cholinergic mechanisms. The inability of QNB to inhibit PNIC suggests that PNIC is not entirely acetylcholine mediated. [Abstract O.41 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2633. Mansour, N. A. (Div. Pestic. Chem., Fac. Agric., Univ. Alexandria, Alexandria, Egypt) **Interaction**

of several pesticides with synaptic proteins; acetylcholinesterase and acetylcholine receptor-ionic channel complex. *Toxicol. Lett.* 5(Sp 1): 36; 1980.

The effects of several pesticides on protein macromolecules in cholinergic transmission, on AChE and an acetylcholine receptor-ionic channel complex were examined. The binding of specific ligands to receptor and ionic channel proteins in Torpedo electric organ membranes was studied as well as the carbamylcholine-induced ^{22}Na efflux from microsacs of the same organ. No effect on (^3H)ACh binding to its receptor was found with many anticholinesterase compounds. A few compounds inhibited binding as strongly as did *d*-tubocurarine. Chlorobenzilate was found to bind to the central muscurinic ACh-receptor of mammalian brain as shown by its displacement of atropine sensitive (^3H) quinuclidinyl benzilate binding with K*i* of 15 μM. Tetracaine inhibited the activation of ^{22}Na efflux by this compound. AChE and (^3H) ACh binding to its receptor were not inhibited by 100 μM chlorobenzilate, a level which activated ^{22}Na efflux. However, inhibition of 60% of the (^3H) perhydrohistrionicotoxin binding of the ACh-receptor, which is a specific ligand for the ionic channel, took place in the presence of chlorobenzilate. [Abstract O.42 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2634. Desaiah, D.; Trottman, C. H. (Dep. Neurol., Univ. Mississippi Med. Cent., Jackson State Univ., Jackson, MI) **Sensitivity of rat brain synaptosomal AT-Pases to several structurally related organochlorine compounds.** *Toxicol. Lett.* 5(Sp 1): 37; 1980.

The effects of chlordecone, mirex and 4 mirex photoderivatives on the synaptosomal Na^+,K^+ and Mg^{2+} ATPases of rat brain were studied. Synaptosomes were prepared by Ficoll-sucrose gradient techniques and Na^+,K^+ stimulated, oligomycin-sensitive Mg^{2+} (OS) and oligomycin-insensitive Mg^{2+} (OI) ATPases were measured before and after the addition of different concentrations of the test compounds. OS proved more sensitive to the test chemicals followed by Na^+,K^+ then OI. Chlordecone was the strongest inhibitor, followed by the mirex photoderivatives, then mirex. Less than 1 μM of chlordecone produced a 50% inhibition of ATPase activity as compared to 20 μM of the mirex derivatives to achieve the same effect. These findings suggest that neurotoxic symptoms related to chlordecone poisoning may be related to synaptosomal ATPase inhibition. [Abstract O.43 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2635. Kuroda, Y. (Tokyo Metrop. Inst. Neurosci., Fuch-shi, Tokyo 183, Japan) **Brain slices, assay systems for the neurotoxicity of environmental pollutants and drugs on mammalian central nervous system.** *Toxicol. Lett.* 5(Sp 1): 37; 1980.

Very little research had been conducted on mammalian nerve preparations for studying neurotoxicity due to exposure to environmental pollutants. Guinea pig olfactory cortex slices may be used to get accurate dose-response curves on synaptic nerve transmission at the site of action. Slices are incubated in Krebs-Ringer-glucose medium and electrical stimulation is applied to the ends of lateral olfactory tracts. Post-synaptic potentials (PSP) were stable for over 16 hr as they were measured from the surface of the slices. DDT at 5×10^{-4} *M* caused PSP inhibition (70% of control) within 1 hr. No alteration in presynaptic fiber potentials (FP) were found, indicating that DDT affects mainly the trans-synaptic processes. A 0.02% (v/v) suspension of toluene gave 70% inhibition of PSP and FP within 10 min showing that toluene inhibits impulse propagation along the axon. With this system, applications of an agent at different doses may be made successively or different agents may be applied when the previous one had no effect. Biochemical changes may also be observed concurrently with electrophysical changes. [Abstract O.44 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2636. Swanson, K.; Woolley, D. (Dep. Anim. Physiol. & Environ. Toxicol., Univ. California, Davis, CA) **Evoked hippocampal potentials as a sensitive index of dieldrin's toxicity.** *Toxicol. Lett.* 5(Sp 1): 38; 1980.

The effects of single doses of dieldrin on averaged evoked potentials (AEPs) were recorded from different sections of the brains of awake unrestrained rats with chronically implanted electrodes. Dieldrin given orally at 25 and 40 mg/kg produced the greatest effect on hippocampal potentials evoked by stimulation of the prepyriform (olfactory) cortex (PPC) or lateral olfactory tract (LOT). Hippocampal potentials elicited by septal stimulation were affected to a much lesser extent. Little if any changes occurred with PPC response to LOT stimulation. Hippocampal potentials evoked by LOT or PPC stimulation were increased in amplitude 4- or 5-fold and dieldrin increased peak latencies by 50%. Overt seizures on days 1 through 6 occurred after the higher dose was given in addition to repeated stimulation on the PPC at 1/sec to elicit the hippocampal AEP. Increases were also found in the amplitudes and latencies of flash-evoked AEPs measured from the visual cortex, but to a lesser degree than those found in hippocampal AEPs evoked by stimulation of the olfactory cortex. The observed effects of dieldrin on olfactory-evoked hippocampal potentials may be related to the convulsant actions of the pesticide. [Abstract O.45 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2637. Sudershan, P.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois, Chicago, IL 60680) **Biotransformations of ^{14}C-endrin and ^{14}C-dieldrin by bluegill fish.** *Toxicol. Lett.* 5(Sp 1): 38; 1980.

The uptake, metabolism, and elimination of ^{14}C-endrin and ^{14}C-dieldrin by bluegill (*Lepomis macrochirus*) were examined during a 48 hr exposure study. Under static conditions in 6 *l* of water, 85% of 1 ppb of en-

drin and 70% of 50 ppb of dieldrin were absorbed by the fish. Following transfer to clean water, the fish exposed to dieldrin eliminated less than 20% of the absorbed radioactivity in 3 wk as compared to 40% by the endrin-exposed fish. Six radioactive conjugated metabolites were obtained from the endrin-exposed fish. TLC autoradiography and GLC were used for their identification. Approximately 75% of absorbed radioactive material recovered from the fish was due to endrin. The major product of dieldrin metabolism was Klein's metabolite (bridged pentachloroketone). Five other unidentified dieldrin metabolites were also obtained. Pentachloroketone was also detected in trace quantities in visceral extracts. [Abstract O.46 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2638. Parvu, M.; Sendrea, D.; Colosi, D. (Inst. Med. & Pharm., Cluj-Napoca, Romania) **The estimation of the toxic action of organochlorine insecticide toxaphene by using some biochemical indicators.** *Toxicol. Lett.* 5(Sp 1): 39; 1980.

Studies were conducted on the selective action of toxaphene on liver tissue by determining its effects on the level of total lipids, free fatty acids, cholesterol and changes in total liver wt. Wistar rats were orally given 0.4 mg of toxaphene/100 g body wt in oily solution daily for 30 days. Lipids tended to accumulate in the livers of treated rats while free fatty acids were oriented towards lipid synthesis. Decreases in the level of free fatty acids could also be correlated with increased levels of hepatic cholesterol. The action of toxaphene on the brain was also evaluated by determining the activities of cholinesterase and ATPase. Results of these studies showed that toxaphene does not exert much effect on the nervous system. [Abstract O.47 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2639. Lundholm, C. E. (Dep. Pharmacol., Linkoeping Univ., Linkoeping, Sweden) **Comparison of *p,p'*-DDE on eggshell thickness and Ca-binding activity of shell gland in ducks.** *Toxicol. Lett.* 5(Sp 1): 39; 1980.

DDT and DDE have been shown to reduce the reproductive success of several species of birds by reducing the eggshell thickness. Two different strains of ducks fed 40 mg/kg of *p,p'*-DDE for 45 days exhibited a significant and long-lasting reduction in shell thickness. A more marked reduction occurred in an Indian Runner (IRD) than in a Swedish Rouen (SR) breed. *p,p'*-DDE residues in the egg were similar in the 2 species. The *o,p'*-DDE isomer given at the same levels had less effect on eggshell thickness and left smaller residue levels in the eggs of the IRD breed. Shell gland homogenates from the SR duck accumulated $^{45}Ca^{2+}$ in the presence of ATP. NaN_3 inhibited this accumulation by 50% and 3 m*M* of mersalyl inhibited it completely. Both the *p,p'*- and *o,p'*-isomers in the incubation medium decreased Ca^{2+}-binding in a dose dependent manner. Threshold level was about 20 ppm, while 40 ppm decreased accumulation by 40%. The effects of DDE on eggshell thickness may be related to the Ca-binding of the membranes of eggshell glands. [Abstract O.48 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2640. Holland, J. P.; Smith, I. K. (Cent. Toxicol. Lab., Imp. Chem. Ind. Ltd., Alderley Park, Nr Macclesfield, Cheshire, England) **The effect of synthetic pyrethroids on the cardiovascular system of the rat.** *Toxicol. Lett.* 5(Sp 1): 50; 1980.

The cardiovascular effects of the synthetic pyrethroid insecticides permethrin and cypermethrin were studied in rats. Animals were given oral doses of 1000 mg permethrin/kg or 350 mg cypermethrin/kg, then anesthetized and prepared for monitoring of blood pressure and respiratory rate. Response to a series of challenges was evaluated. The results indicate that both insecticides abolished the increase in respiratory rate following acetyl choline, while cypermethrin lessened the decrease in respiratory rate induced by noradreniline. Cypermethrin also affected the pressor response to isoprenaline and the cardiovascular response to tyramine. Control and treated groups both experienced the same response to carotid occlusion and DMPP. It is concluded that both pyrethroids affect the reflex control of respiration, while only cypermethrin affects the autonomic control of circulation. [Abstract O.70 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2641. Mansour, N. A.; Sherby, S. M.; El-Sebae, A. H. (Div. Pestic. Chem., Fac. Agric., Univ. Alexandria, Alexandria, Egypt) **Effect of gossypol on *Spodoptera littoralis* midgut microsomal *N*-demethylation and adenosine triphosphate activities; its potential on insecticide efficacy.** *Toxicol. Lett.* 5(Sp 1): 51; 1980.

Experiments were carried out to determine some effects of gossypol, a substance naturally occurring in the pigment glands of cotton, on larvae of the Egyptian cotton leafworm *(Spodoptera littoralis)* and to evaluate its potential effect on insecticide efficacy. Feeding gossypol to the larvae stimulated the microsomal *N*-demethylation enzyme activity *in vitro* in a time-dependent fashion. Gossypol did not alter the *Km*, but did increase the maximal velocity of *p*-chloro-*N*-methylaniline demethylation. Gossypol stimulation of midgut microsomal oxidases is suggested to be due to an increase in enzyme synthesis. The demethylation of the 2 carbamate insecticides aminocarb and Zectran (mexacarbate) was increased. Gossypol stimulated adenosine triphosphatase activity at low concentrations, but inhibited it at higher concentrations. The inhibition was approximately equal to that of DDT and 7-fold higher than that of Sumicidin (fenvalerate). [Abstract O.72 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2642. Zlateva, M.; Kamenova, M. (Dep. Pathol., Med. Acad., Sofia, Bulgaria) **Effects of phosphororganic**

pesticide zolone on brain morphology of rats. *Toxicol. Lett.* 5(Sp 1): 136; 1980.

Male rats weighing 140 g were given daily oral pesticide doses of 0.1932 mg of zolone (phosalone), an organophosphorus pesticide, for 5 wk. Light and electron microscope examinations of the sensory-motor cortex, putamen, and palladium showed neuron degeneration in the pre-synaptic vesicles. Myelin sheaths exhibited pocket-like invaginations. Phagocytic activity and increased gliofibrillar production of astroglial cells were also observed. [Abstract P.22 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2643. van Hooidonk, C.; Ceulen, B. I.; Kienhuis, H.; Bock, J. (Prins Maurits Lab., TNO, Rijswijk, The Netherlands) **Rate of skin penetration of organophosphates measured in diffusion cells.** *Toxicol. Lett.* 5(Sp 1): 137; 1980.

An *in vitro* study was made of the penetration rates and delay times of *S*-(2-diisopropylaminoethyl) ethyl methylphosphonothiolate (VX) and soman in the skin of guinea pigs and humans. VX was labeled with ^{35}S and soman with ^{32}P to determine the degree of decomposition of the compounds during passage through the skin. Biochemical and radiological analyses showed that VX passes unaltered through human skin but is slightly decomposed by guinea pig skin. Soman is decomposed by at least 80% in human skin and by 30% in guinea pig skin. [Abstract P.24 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2644. Andreas, K.; Fischer, H. D. (Inst. Pharmacol. & Toxicol., Med. Acad. Carl Gustav Carus, DDR-8010 Dresden, DDR) **Influence of neuroleptics on the toxicity of organophosphorus compounds.** *Toxicol. Lett.* 5(Sp 1): 137; 1980.

The inhibition of acetylcholinesterase seems to have little to do with the mechanism of delayed neurotoxicity induced by organophosphorus compounds. Interactions with the cAMP system, aminergic transmitters and other enzymes are all connected with the acute effects of these compounds. The LD50 of dichlorvos to male, albino mice was determined after pre-medication with dopaminergic substances. The acute lethality of dichlorvos was decreased by single and repeated (daily for 7-11 days) administration of 2 mg/kg haloperidol, and a single dose of 10 mg/kg apomorphine. It was concluded that these drugs directly influence the activity of acetylcholinesterase without effects mediated by the dopaminergic system. [Abstract P.25 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2645. Verschoyle, R.; Aldridge, W. N.; Cabral, J. R. P. (Toxicol. Unit, Med. Res. Counc., Surrey, England) **Toxicology of trimethyl- and triethyl phosphorothioates.** *Toxicol. Lett.* 5(Sp 1): 138; 1980.

Trimethyl- and triethylphosphorothioates occur as impurities in organophosphorus pesticides. *O,O,S*-Trimethylphosphorothioate (I), *O,S,S*-trimethylphosphorothioate (II), *O,O,S*-triethyl phosphorothioate (III), and *O,S,S*-triethylphosphorodithioate (IV) all produce late deaths when given orally to rats. All bring on cholinergic symptoms which vary in their intensity and persistence. Atropine treatment (10 mg/kg) fails to block the occurrence of delayed deaths after treatment with 50 mg/kg of II. Weight loss still occurs after administration of P_2S or P_2S + atropine, but survival time is increased with these treatments when given on the first day. At 3 days, treatment with P_2S + atropine was ineffective. A liquid diet of Vivonex did not increase survival time although weight loss was reduced. Brain acetylcholinesterase and plasma cholinesterase and carboxylesterase were inhibited by I, II, and IV *in vivo*. However, after day 1, activity of these enzymes begins to return and is 50% of control by day 4. Respiratory distress is caused by I and II, and II has been observed to induce areas of interstitial thickening in the lung. Macroscopic studies suggest all four compounds may cause pulmonary lesions. [Abstract P.26 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2646. Clothier, B.; Johnson, M. K.; Reiner, E. (Toxicol. Unit, Med. Res. Counc., Surrey, England) **Interaction of bovine erythrocyte acetylcholinesterase with trialkyl phosphorothiolates.** *Toxicol. Lett.* 5(Sp 1): 138; 1980.

O,O,S-Trimethyl (I), *O,S,S*-trimethyl (II), *O,O,S*-triethyl (III), and *O,S,S*-triethyl (IV) phosphorothiolates inhibit bovine AChE with second order rate constants of 40, 750, 55, and 8700 mole/min, respectively, at 37°C and pH 7.4. Inhibition measurements of I, II, and III are confused by formation of Michaelis complexes. Half-lives of spontaneous reactivation and aging after inhibition by I are 1 and 8 hr; after II, 0.1 and 0.5 hr; after III, both greater than 24 hr; and after IV, 0.3 and 3-4 hr, respectively. After inhibition by I, II, and III, the inhibited species formed is the same as those formed from dichlorvos, isomalathion, and paraoxon, respectively. These findings suggest that a thiol-group is lost during the inhibition by I, II, and III. Under normal conditions for study of AChE inhibition by II, progressive phosphorylation is accompanied by formation of substantial proportions of the Michaelis complex and spontaneous reactivation and aging of inhibited enzyme. [Abstract P.27 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2647. Bisso, G. M.; Giardini, V.; Meneguz, A.; Michalek, H. (Lab. Pharmacol., Ist. Sup. Sanit., Rome, Italy) **Brain cholinesterase recovery in rats as a function of treatment order after a second organophosphate intoxication.** *Toxicol. Lett.* 5(Sp 1): 139; 1980.

Male Wistar albino rats were given repeated sc doses of DFP at 1.1 mg/kg in arachis oil and paraoxon at 0.25 mg/kg in water. Cholinesterase (ChE) was determined on brain homogenate and on 100,000 *g* supernatant using Ellman spectrophotometry. Molecular forms in the 100,000 *g* supernatant fraction were separated by polyacrylamide gel electrophoresis, then enzymatic reaction with acetylthiocholine before quantitative evaluation of the bands. When the order of repeated challenges was DFP-paraoxon at 35 day intervals, higher final ChE levels were obtained after the second treatment than when the order of treatment was reversed. When repeated treatments used the same agent, the longitudinal interactions seemed less marked. Similar interactions did not reach statistical significance when treatment with a second organophosphate was followed by measurements during acute intoxication. The greater recovery in DFP-paraoxon treated rats in the late stages of intoxication had, in addition, a change in the percentage contribution of individual molecular forms with a relative increase of forms of low molecular wt as compared to the other groups. [Abstract P.28 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2648. Willems, J.; Zutterman, F.; Blondeel, G.; Braeckman, R. (Heymans Inst. Pharmacol., Univ. Gent Med. Sch., Gent, Belgium) ***In vitro* disappearance of methyl paraoxon in dog plasma.** *Toxicol. Lett.* 5(Sp 1): 139; 1980.

In vitro studies of the disappearance of 0.25-1200 μg/ml methyl paraoxon were carried out in undiluted dog plasma. A first-order process with a half life of 3 hr at 25°C was found for all concentrations studied. A half life of 12 hr was found at 0°C. EDTA (2.10 m*M*), copper (0.110 m*M* and 5.10 m*M*), *N*-ethylmaleimide (0.310 m*M*), and *p*-chloromercuribenzoate (71.0 μ*M*) showed no consistent inhibition of the methyl paraoxon disappearance. Methyl paraoxon degradation was blocked after heating for 1.5 min at 90°C after dilution of the plasma. Methyl paraoxon diluted in aqueous suspensions of erythrocytes was degraded more rapidly than in plasma. [Abstract P.29 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2649. Vachkova, R.; Vasileva, L. (Inst. Nutr., Sofia, Bulgaria) **Study of the combined effect of pyrazophos and lindane.** *Toxicol. Lett.* 5(Sp 1): 140; 1980.

Equitoxic doses of pyrazophos and lindane were administered orally to rats simultaneously in acute and subacute (5 days) experiments. Antagonistic effects were observed in the acute studies, while in the subacute study the anticholinesterase effect of pyrazophos and the clastogenic activity of lindane were noted in rats given the compounds in combination. A significantly shortened sleeping time was noted in the groups given lindane, pyrazophos and the two compounds in combination, but the effect was more pronounced in the rats given both. The findings indicate the independent action of these two pesticides. [Abstract P.30 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2650. Willems, J.; Braeckman, R.; Belpaire, F. (Heymans Inst., Med. Sch., Div. Gent, Gent, Belgium) ***In vitro* extraction of methyl parathion by the liver.** *Toxicol. Lett.* 5(Sp 1): 140; 1980.

Studies on the fate of methyl parathion in the conscious dog indicate that total serum clearance of the compound is about equal to hepatic serum flow. Only part of the oral dose reaches the systemic circulation. The hepatic extraction of methyl parathion was examined in isolated perfused rat liver. Methyl parathion (1.15 mg) was added to 100 ml of recirculating perfusate. Simultaneous determinations were made of perfusate levels of methyl parathion before and after the liver and extraction ratios of 90% were reached showing the high level of hepatic uptake. Pre-liver perfusate concentrations showed a biphasic decline in function of time upon kinetic analysis. This may be hazardous because of the partial disappearance of methyl parathion from the perfusate when it is circulated in the absence of the rat liver. [Abstract P.31 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2651. Neskovic, N.; Meljnikov-Vuksa, M. (Dep. Pestic., INEP, Yu-11080 Zemun, Yugoslavia) **Toxicity and effects of trichlorfon and warfarin on hepatic microsomal enzymes in rats.** *Toxicol. Lett.* 5(Sp 1): 141; 1980.

Warfarin was given orally to rats at doses of 0.10 and 0.25 mg/kg every second day for 90 days. Trichlorfon was administered at 7.47 mg/kg/day to rats in drinking water for 90 days. Effects of the pesticides on NADPH-cytochrome *c* reductase activity, cytochrome P450 content in hepatic microsomes, body wt gain and organ wt were determined. In the warfarin and trichlorfon treated groups, no statistically significant changes in single organ wt or body wt were found. Warfarin at a dose level of 0.25 mg/kg caused a significant increase in NADPH-cytochrome *c* reductase activity, while at 0.10 mg/kg, no significant changes in the activity of this enzyme occurred. Warfarin at 0.25 mg/kg increased cytochrome P450 activity significantly. NADPH-cytochrome *c* reductase activity and cytochrome P450 content were significantly increased only in males of the trichlorfon-treated group. [Abstract P.32 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2652. Abou-Donia, M. B.; Varga, P. A.; Graham, D. G.; Kinnes, C. G. (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **Delayed neurotoxicity of a single dermal administration of *O*-ethyl *O*-4-nitrophenyl phenylphosphonothioate and tri-*O*-cresyl phosphate to cats.** *Toxicol. Lett.* 5(Sp 1): 141; 1980.

EPN at 22.5-225 mg/kg or TOCP at 500-5000 mg/kg produced signs of delayed neurotoxicity in most of

the cats that were treated dermally with technical grades of these compounds for 90 days. Acute LD50 values of EPN and TOCP were 45 mg/kg and 1500 mg/kg, respectively. Severity of clinical symptoms showed dose-dependence with small doses producing ataxia and large doses resulting in paresis. EPN and TOCP produced similar histopathology of cat nerve tissues with axon and myelin degeneration in spinal cord and peripheral nerves. In all cats, a dose-dependent inhibition of plasma butyrylcholinesterase was observed which was greatest in the week following topical administration with subsequent recovery. Control groups consisted of untreated cats and cats given a single dermal dose of 10 mg/kg parathion. Cats given parathion were initially weak and subsequently recovered without the development of delayed neurotoxicity. [Abstract P.33 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2653. Feroz, M.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois, Chicago, IL) **Metabolic fate of photoheptachlor in the rat and rabbit.** *Toxicol. Lett.* 5(Sp 1): 142; 1980.

^{14}C-Photoheptachlor was given ip to male rabbits at 0.80 mg/kg and to male and female rats at 0.93 mg/kg. All animals were examined for several weeks for elimination of radiocarbon in the excreta. In rabbits, the compound was excreted almost entirely in the urine, while in rats of both sexes elimination of radioactivity occurred in both feces and urine. A 10 wk half-life for photoheptachlor was estimated for male rabbits, 0.6 wk for female rats, and 2.2 wk for male rats. At the end of the study, the highest ^{14}C-residues were found in the adipose tissues for all animals. In female rats, high residue levels also occurred in skin and ovaries. Excreted metabolites were isolated and purified by extraction with organic solvents, column chromatography, TLC and GLC. Spectroscopy and enzymatic techniques showed that two of the metabolites were isomeric monohydroxylated compounds, one of which was conjugated with glucuronic acid. [Abstract P.34 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2654. Feroz, M.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois, Chicago, IL) **Metabolism of photo-*cis*-chlordane in the rat.** *Toxicol. Lett.* 5(Sp 1): 142; 1980.

Labeled photo-*cis*-chlordane was given orally and ip to male albino rats at 3.12 mg/rat. Elimination of radioactivity was studied for 3 wk. Half life for the oral dose was less than 1 day, and for the ip dose, less than 1 wk. Radiocarbon residual load was approximately 0.75% for orally-dosed and 5.65% for ip-dosed rats. The major compound in the retained radioactivity was unchanged photo-*cis*-chlordane. Analyses of extracts of excreta of treated rats exhibited extensive biotransformation of the photoisomer with at least 22 products. Qualitative metabolism patterns were similar whether the compound was given ip or orally, however, quantitative differences in metabolic products of photo-*cis*-chlordane given by the two different routes did occur. [Abstract P.35 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2655. Carevic, O., (Inst. Med. & Psychol. Traffic, Yu-41000 Zagreb, Yugoslavia) **The protective action of d-penicillamine against gamma-hexachlorocyclohexane induced lysosomal membrane injuries.** *Toxicol. Lett.* 5(Sp 1): 143; 1980.

Rats intoxicated with γ-HCH (lindane) were protected against the onset of hepatic cell necrosis and the release of lysosomal enzymes when d-penicillamine was given. d-Penicillamine also significantly reduced the release of lysosomal acid hydrolases *in vitro* when applied to a lysosome-enriched liver suspension treated with γ-HCH. These findings suggest that d-penicillamine stabilizes the lysosomal membrane system of rat liver challenged by γ-HCH. [Abstract P.37 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2656. Roux, F.; Treich, I.; Fournier, E. (Unit. Toxicol. Exp., U. 26, INSERM, Hop. F. Widal, F-75475 Paris 10, France) **Effect of a treatment with the insecticide lindane on the metabolism of different cells in culture.** *Toxicol. Lett.* 5(Sp 1): 144; 1980.

The effects of lindane on cellular incorporation rates of some protein and nucleic acid precursors into acid-soluble and acid-insoluble fractions was studied in glioblast C_6, chick embryo hepatocytes, and PHA-activated human lymphocyte cultures. After a 20 hr treatment, lindane at 2.5-50 μM enhanced all incorporations in the hepatocytes and lymphocytes. Similar changes occurred in the cultures affected by lindane at concentrations greater than 100 μM. ^{3}H-uridine incorporation into the acid-soluble and the acid-insoluble fractions was decreased to the same extent. ^{14}C-α-aminoisobutyric acid and ^{3}H-leucine incorporation into the acid soluble fraction was unchanged or increased while ^{3}H-leucine incorporation into the acid insoluble fraction was reduced. A greater reduction in ^{3}H-thymidine incorporation into the acid-insoluble fraction was observed than was taken up in the acid soluble pool. These alterations were believed to be unspecific and were found to be progressively reversible in about 2 days. [Abstract P.38 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2657. Virtanen, M. T.; Arstila, A. U. (Dep. Cell Biol., Univ. Jyvaskyla, Jyvaskyla, Finland) **Effects of an organochlorine pesticide on the structure of the gills of *Poecilia reticulatus*. Light and electron microscopic study.** *Toxicol. Lett.* 5(Sp 1): 144; 1980.

Fish (*Poecilia reticulatus*) were exposed to *p,p'*-DDT for 12 days in a model ecosystem where the concentration of the insecticide changed from 1.2 ppb the first

day to 3.0 ppb on day 12. Light microscopic examination of gill tissue showed shortened and slack secondary lamellae and swollen chloride cells in the DDT-exposed fish. Electron microscopic examination revealed disorganized gill epithelial cells with numerous cytoplasmic vacuoles and folded plasma membranes. An absence of erythrocytes from the lamellar blood spaces was prominant and the lagunae were filled with membrane-bound electron dense matter. Disintegrated microfilament bundles were also seen in pillar cell cytoplasms. These changes were atypical of those usually accompanying fish pesticide toxicity and they were assumed to be specific to DDT poisoning. Gross observations of fish appearance and behavior proved normal and no mortalities occurred. The presence of only a few erythrocytes in the secondary lamellae where gas exchange takes place suggests that *Poecilia* possesses a high tolerance of low tissue pO_2. [Abstract P.39 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2658. Rozman, K.; Rozman, T.; Greim, H. (Abt. Toxikol., Ges. Strahlen. & Unweltforsch., Munich, BRD) **The mechanism of intestinal elimination of hexachlorobenzene and its enhancement by hexadecane in the rat.** *Toxicol. Lett.* 5(Sp 1): 145; 1980.

^{14}C-Hexachlorobenzene (HCB) at levels of 100 mg/kg body wt and ^{3}H-hexadecane (5% of daily food intake) were given to rats with or without bile duct ligations to study the mechanism of HCB removal from storage tissue. *In situ* preparations of segments of the small intestine, the stoma of the terminal ileum, and the large intestine were also utilized to track down the site of HCB elimination. Results indicate that intestinal elimination of HCB represents the main contribution to HCB fecal excretion, and the whole intestine acts as a site of HCB elimination. Hexadecane specifically stimulates elimination of HCB by the intestine and produces a 3-fold increase in the fecal excretion of HCB. HCB does not utilize the biliary pathway for fecal excretion, however, the influence of this pathway on reabsorption processes may significantly affect the role of the small intestine in total fecal excretion of HCB. [Abstract P.40 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2659. Rozman, T.; Rozman, K.; Greim, H. (Abt. Toxikol. Ges. Strahlen. & Unweltforsch., Munich, BRD) **Quantitative determination of intestinal and biliary elimination of hexachlorobenzene in untreated and mineral oil treated rhesus monkeys with complete biliary bypasses.** *Toxicol. Lett.* 5(Sp 1): 145; 1980.

Mineral oil has been shown to significantly enhance the fecal excretion of hexachlorobenzene (HCB) in the rhesus monkey. The present study examines the quantitative contributions of the enterohepatic circulation (EHC) and the intestinal elimination to the total HCB excretion in untreated and mineral oil treated rhesus monkeys. The malabsorption of biliary and intestinally eliminated HCB in the absence of bile was also assessed. Two male and two female monkeys were given 100 mg/kg of body weight ^{14}C-HCB. After 2 wk biliary bypass operations were performed on the animals. HCB levels in blood, bile, urine, feces and adipose tissue were determined during recovery after the operation, while readministering the bile excreted the previous day, while giving the uncontaminated bile, and in the absence of bile. It was found that EHC contribution to the total fecal HCB excretion was negligible in monkeys with normal bile flow. The main source of fecal excretion of HCB was the intestine. A 6-fold increase in the fecal excretion of HCB occurred in the monkeys given 5% mineral oil in the diet. Mineral oil specifically stimulated the intestinal elimination of HCB. The malabsorption due to the lack of bile served to enhance the total fecal excretion of HCB. [Abstract P.41 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2660. Lock, E. A. (Biochem. Mech. Sect., Cent. Toxicol. Lab., ICI Ltd., Alderley Park, Nr Macclesfield, Cheshire SK10 4TJ, England) **Biochemical changes in the rat cerebellum following cypermethrin administration.** *Toxicol. Lett.* 5(Sp 1): 146; 1980.

Rats were used in studies to correlate changes in brain metabolites following administration of the synthetic pyrethroid insecticide cypermethrin with signs of toxicity. An LD50 dose of cypermethrin was administered to male rats iv. Rats showed profuse salivation followed by clonic seizures leading to sinuous writhing. Rats were killed by microwave irradiation at 10 min (salivation), 30 min (first seizure) or 45 min (writhing). Concentrations of some acids and cycle nucleotides were determined in blood and cerebellum. Cerebellar cyclic GMP increased, while AMP did not change. There was an increase in cerebellar glucose (30 min) and lactate (30 and 45 min), with blood glucose and lactate also increasing. In some animals cerebellar and plasma ammonia was elevated at 30 and 45 min. [Abstract P.42 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2661. Lock, E. A.; Scales, D.; Little, R. A. (Biochem. Mech. Sect., Cent. Toxicol. Lab., ICI Ltd., Alderley Park, Nr Macclesfield, Cheshire SK10 4TJ, England) **Observations on 2'-chloro-2,4- dinitro-5',6-di(trifluoromethyl) diphenylamine induced oedema in the white matter of the central nervous system of the rat.** *Toxicol. Lett.* 5(Sp 1): 146; 1980.

Some aspects of the toxicity of the acaricide 2'-chloro-2,4- dinitro-5,6-di(trifluoromethyl) diphenylamine (CDTD) to rats were studied. Earlier studies have shown that oral administration of CDTD causes death in 2-3 days, and death is probably related to an increase in brain and spinal cord fluid. This study was carried out to determine whether the edematous change produced by CDTD was reversible, and whether it caused an elevation in cerebro-spinal fluid pressure. Rats were dosed orally with 25, 75 or 200 mg CDTD/kg, resulting in a reversible, dose-

dependent increase in the water content of the brain, spinal cord and optic nerve. At a dose of 75 mg/kg, animals developed hind limb weakness associated with an elevated cerebro-spinal fluid pressure. Treatment of animals showing hind limb weakness with hypertonic urea lowered cerebro-spinal fluid pressure and reduced brain water, but did not remove all the fluid due to CDTD administration. [Abstract P.43 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2662. Hoellinger, H.; Sonnier, M.; Nam, N. H.; Do-Cao, T.; Fournier, E. (Unite Toxicol. Exp., Hop. F. Widal, INSERM, Paris, France) **Toxicologic studies of pyrethroid insecticides: covalent binding of resmethrins and/or their metabolites to hepatic proteins.** *Toxicol. Lett.* 5(Sp 1): 147; 1980.

In vitro studies were designed to elucidate the toxicological effects of the pyrethroid insecticides (phenyl-U-^{14}C) cismethrin *(cis)* and (phenyl-U-^{14}C) bioresmethrin *(trans)*. Incubation in S-9 rat liver homogenate or hepatic microsomes resulted in covalent binding/mg protein of 80 ng for *cis* and 43 ng for *trans*. Covalent binding and *in vitro* metabolism of *cis* and *trans* are different, and the binding is dependent on enzymatic induction, the NADPH generating system and the substrate concentration, but not on cytochrome P-450. Subtilisine-GC-MS analysis indicated the metabolites to be oxidized derivatives from parent compounds. [Abstract P.44 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2663. Cova, D.; Chiesara, E.; Rizzi, R. (Dep. Pharmacol., C.N.R. Cent. Cytoparmacol., Univ. Milan, Milan, Italy) **Some aspects of metabolic fate of vinclozolin.** *Toxicol. Lett.* 5(Sp 1): 147; 1980.

In vivo and *in vitro* tests were carried out to study the biotransformation of vinclozolin, a foliar fungicide obtained from 3,5-dichloroaniline. An HPLC method allowed identification of vinclozolin and its chief metabolite *N*-(3,5-dichloro) phenyl 2,3,4 trihydroxy,2 methylbutiramide. *In vivo* studies showed rapidly decreasing vinclozolin blood levels and the appearance of the metabolite and 2 unidentified substances. A mixed function oxidation system metabolizing vinclozolin is suggested by the fact that *in vitro* experiments with liver microsomes show similar results. The results suggest that vinclozolin metabolism occurs via an epoxide intermediate. [Abstract P.45 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2664. Lowy, R.; Griffaton, G.; Pelissier, M. A. (Lab. Biol., U 177 INSERM, CNAM, Paris, France) **The dose-response relationship of rat organ weights under dietary thiram influence.** *Toxicol. Lett.* 5(Sp 1): 148; 1980.

Toxicity studies were carried out in which rats were fed various doses of the dithiocarbamate fungicide thiram for 29 days, and body and organ weights determined. A dose-response relationship regarding organ weights was demonstrated. A log-probit model was successfully fitted to the experimental data. The dietary no-effect level was estimated at 28 ppm. The smallest dose inducing least significant differences (LDS dose) was observed with the epididymal fat pads (130 ppm). [Abstract P.46 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2665. Olorunsogo, O. O.; Bababunmi, E. A. (Biomembrane Res. Stn., Biochem. Dep., Univ. Ibadan, Ibadan, Nigeria) **Interference of herbicides with mitochondrial oxidative phosphorylation: the *N*-(phosphonomethyl) glycine model.** *Toxicol. Lett.* 5(Sp 1): 148; 1980.

In vivo and *in vitro* experiments were designed to elucidate the toxic mechanism of the herbicide *N*-(phosphonomethyl) glycine (PMG). In both the rat and the mouse, the acute oral LD50 values (470 mg PMG/kg rat and 1581 mg PMG/kg mouse) were significantly higher than the acute ip LD50 values (235 mg/kg rat and 130 mg/kg mouse). Symptoms observed after all doses included severe stress, enhanced breathing, and hyperthermia. Reduced respiratory control ratios (RCR) and enhanced ATPase activity occurred in mitochondria isolated from livers of rats 5 hr after single ip dosing with 15, 30, 60 or 120 mg PMG/kg. Similar results were obtained *in vitro* using mitochondria from rat liver or corn shoot. PMG was shown to stimulate the rate of O_2 consumption by mitochondria previously inhibited by oligomycin. It is suggested that a major lesion in PNG toxicity may be the uncoupling of oxidative phosphorylation in plant and animal mitochondria. [Abstract P.47 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2666. Chin, B. H.; Heilman, R. D.; Bachand, R. T.; Chernenko, G.; Barrowman, J. (Diamond Shamrock Corp., Painesville, OH) **Absorption and biliary excretion of chlorothalonil and its metabolites in the rat.** *Toxicol. Lett.* 5(Sp 1): 150; 1980.

Metabolic studies were carried out with the agricultural fungicide chlorothalonil. Rats received an oral dose of uniformly ring-labeled chlorothalonil (^{14}C-chlorothalonil). At least 85% of the dose was recovered in the feces in 4 days, and 8% in the urine. About 95% of the radioactivity was recovered within the first 48 hr. In other studies, rats with duodenal catheters and external biliary fistulae were treated with 5 mg/kg of ^{14}C-chlorothanlonil to determine whether there is an enterohepatic circulation of the compound. Biliary radioactivity recovered in 24 hr was 2.65% of the administered dose, which approximates the amount of impurities administered with the ^{14}C-chlorothalonil. It is suggested that absorption of chlorothalonil from the GI tract is minimal. [Abstract P.49b presented at the 2nd Int. Congr. Toxicol., 1980]

80-2667. Maes, V.; Maras, Y.; Vercruysse, A. (Dienst Farm. Fytochem. & Toxicol., Vrije Univ. Brussels, Brussels, Belgium) **Binding of warfarin to human serum albumin: equilibrium and kinetics study.** *Toxicol. Lett.* 5(Sp 1): 162; 1980.

Binding studies were carried out with warfarin. The increase in fluorescence quantum yield of warfarin upon binding to human serum albumin was used. The association constant of the ligand for the high affinity site on the protein was determined, and a thermodynamic analysis of the warfarin-albumin interaction was carried out. Fluorescence stopped-flow technique was used to study the kinetics of the binding, and activation thermodynamics parameters were calculated. [Abstract P.73 presented at the 2nd Int. Congr. Toxicol., 1980]

80-2668. Debets, F. M. H.; Strik, J. J. T. W. A.; Olie, K. (Dep. Toxicol., Agric. Univ., Wageningen, The Netherlands) **Effects of pentachlorophenol on rat liver changes induced by hexachlorobenzene, with special reference to porphyria, and alterations in mixed function oxygenases.** *Toxicology* 15(3): 181-195; 1980 (56 references).

Four groups of adult female Wistar rats were given free access to standard powdered diets containing either 1000 ppm pure hexachlorobenzene (HCB), 500 ppm pure pentachlorophenol (PCP), or both compounds in the same amounts. The fourth group served as controls. Animals were sacrificed 1, 2, 4, 6 or 8 wk after the start of treatment. Food consumption declined slightly in the combined treatment group and increased in the HCB group. During the 5th wk 6 of 8 rats in the HCB-group and 2 of 8 in the combinated treatment group developed skin lesions. Slight chronic neurotoxic symptoms were noted in the HCB groups during the last 2 wk of treatment. Liver weight increased in animals receiving HCB either alone or in combination. All diets increased the cytochrome P-450 concentration. An increase in urinary excretion of total porphyrins was noted at 3 wk in the combined treatment group. An increase in urinary excretion of uroporphyrin and a decrease of porphyrins with 2 and 3 carboxylic groups began about 3 wk earlier in the combined group than in HCB treated animals.

80-2669. Dodson, J. J.; Mayfield, C. I. (Dep. Biol., Univ. Laval, Quebec G1K 7P4, Canada) **The dynamics and behavioral toxicology of Aqua-Kleen (2,4-D butoxyethanol ester) as revealed by the modification of rheotropism in rainbow trout.** *Trans. Am. Fish. Soc.* 108(6): 632-640; 1979 (17 references).

The effects of the butoxyethanol ester of 2,4-D (2,4-DBEE) and its commercial formulation, Aqua-Kleen, on the rheotropic response in rainbow trout *(Salmo gairdneri)* were studied. In order to generate a rheotropic response, a striped background was moved past the fish to simulate the visual stimuli produced by displacement of fish in a water current. Orientation and kinetic components of the rheotropic response were quantified following exposure to 0-7.0 mg/l Aqua-Kleen (field application concentrations). The 2,4-DBEE levels in fish samples and in water samples were determined by gas chromatography. The frequency of positive rheotaxis decreased with increasing 2,4-DBEE concentration. As concentrations approached lethal levels, rainbow trout became extremely lethargic and did not avoid capture. Aqua-Kleen was found to be lethal to rainbow trout at levels approximately twice the suggested field application rates. In general, the smallest fish were the least affected. The results suggest that impairment of positive rheotaxis at active-ingredient concentrations of 2-4 mg/l may lead to the downstream displacement of trout populations, which could be deleterious during upstream spawning migrations.

80-2670. Orciari, R. D. (Connecticut Dep. Environ. Prot., Middlebury, CT 06762) **Rotenone resistance of golden shiners from a periodically reclaimed pond.** *Trans. Am. Fish. Soc.* 108(6): 641-645; 1979 (21 references).

Laboratory bioassay tests were carried out to determine whether golden shiners *(Notemigonus crysoleucas)* which repeatedly reinfested a pond after 6 successive rotenone reclamations, had developed resistance to rotenone. Paired bioassays were set up using golden shiners from the treated pond and from comparison, untreated ponds. A commercial formulation containing 5% rotenone (used at concentrations of 1.0, 0.56, 0.32, 0.18 and 0.10 mg/l) and another formulation containing 2.5% rotenone and 2.2% sulfoxide synergist (used at concentrations of 0.56, 0.32, 0.18, 0.10, 0.056 and 0.032 mg/l) were tested. Mortality data were used to calculate LC50s and tolerance ratios. In each paired bioassay, fish from the treated pond had higher LC50 values than fish from comparison ponds, and differences in mortality were significant at the 95% level in every test. The golden shiners from treated ponds were 4.0-7.1 fold more tolerant of synergized and unsynergized formulations of rotenone than fish from untreated ponds. However, when compared with fish from a pond treated once, they were only 2.4 times more tolerant. It is suggested that the golden shiners developed increased resistance to rotenone through the selective forces of reclamation.

80-2671. Bookhout, C. G.; Costlow, J. D.; Monroe, R. J. (Mar. Lab., Duke Univ., Beaufort, NC 28516) **Kepone effects on development of *Callinectes sapidus* and *Rhithropanopeus harrisii*.** *US EPA Rep.* EPA 600/3-79-104: 36 pp.; 1979 (31 references).

Laboratory experiments were conducted to determine the effects of Kepone (chlordecone) on the development of *Callinectes sapidus* from the time of hatching until the first crab stage was reached. For comparison, similar investigations were made to ascertain the effects of Kepone on larval development of *Rhithropanopeus harrisii*. Of the

concentrations tested, 35, 50, 65 and 80 ppb Kepone were found to be sublethal and 95, 110 and 125 ppb Kepone were acutely toxic to *R. harrisii* larvae; whereas 0.1, 0.5 and 0.75 ppb were sublethal and 1.0 ppb Kepone was acutely toxic to *C. sapidus* larvae. The duration of zoeal development and total time from hatching to first crab were in general prolonged with concentration in *R. harrisii*; whereas, in *C. sapidus*, no significant relationship could be detected between Kepone concentration and duration of zoeal development, but there was a significant relationship to first crab stage. The developmental stages in which the larvae are particularly sensitive differ in the two species. (Author abstract by permission)

80-2672. Manzo, L.; Gregotti, C.; Di Nucci, A.; Richelmi, P. (Dep. Pharmacol., Sch. Med., Univ. Pavia, Pavia, Italy) **Toxicology of paraquat and related bipyridyls - biochemical, clinical and therapeutic aspects.** *Vet. Hum. Toxicol.* 21(6): 404-410; 1979 (43 references).

A review is presented of the toxicity of the herbicide paraquat and the related bipyridyls diquat and morfamquat (morfamquat dichloride). Paraquat toxicity varies according to species. LD50 values are listed for several species, ranging from 3.0 mg/kg, ip, in guinea pigs to 143.0 mg/kg, os, in Sprague-Dawley rats. In man the LD50 is 4-40 mg/kg, os. The clinical aspects of paraquat poisoning are described, along with methods of diagnosis. Diquat is known to be less toxic than paraquat. Morfamquat is the least toxic. Acute and chronic effects of all 3 compounds are listed. The toxicokinetics are described. It is noted that since bipyridyl compounds are poorly absorbed through biological membranes and binding to plasma membranes is poor, the absorbed compound circulates in the blood in the free form, rapidly spreading to tissues. In man, they are mainly eliminated through the kidney by glomerular filtration and active tubular secretion. Hypothesized mechanisms of action are discussed, along with various forms of therapy.

80-2673. Egekeze, J. O. (Comp. Toxicol. Lab., Kansas State Univ., Manhattan, KS 66506) **Sodium monofluoracetate (SMFA, compound 1080)** - *Vet. Hum. Toxicol.* 21(6): 411-417; 1979 (46 references).

The current literature on the rodenticide sodium monofluoroacetate (sodium fluoroacetate, SMFA, compound 1080) is reviewed. The pharmacological actions of the compounds are highly variable among different species. The LD50 varies from 0.05 mg/kg in the dog to > 500 mg/kg in the South African clawed toad (*Xenopus leavis*). SMFA may be absorbed through the gastrointestinal tract, respiratory tract, open wounds, and mucuous membranes. It is noted that SMFA is characterized by a latent period of 30 min-2.5 hr. The clinical signs are described for dogs and other carnivores, herbivores, rats, and humans. In humans the first indication of SMFA poisoning is the onset of epileptic type convulsions after an initial period of nausea and mental apprehension; eventually coma appears. The mechanism of action is discussed, and is related to its incorporation in and inhibition of citrate metabolism within the tricarboxylic acid cycle. Mechanisms of detoxification are also discussed, and are thought to involve defuorination. Methods of diagnosis and treatment of intoxication are also presented, along with chemical analysis and suggestions for prevention of poisoning. It is noted that SMFA does not create a serious environmental hazard in the United States and Great Britain where its use is strictly controlled. However, in Australia and New Zealand, where SMFA is used extensively, it is recommended that livestock should not be allowed access to grazing land known to contain SMFA bait.

80-2674. Anonymous **Carcinogenesis bioassay of 1,2-dichloroethane (EDC).** *Vet. Hum. Toxicol.* 22(1): 36-37; 1980.

Worker exposure to EDC (ethylene dichloride) may occur during the manufacture of insecticides. Samples of water collected near insecticide manufacturing plants had levels of EDC in the 1-90 ppb range. EDC can enter the body through ingestion, inhalation, or skin absorption. Acute poisoning causes headache, dizziness, unconsciousness, internal bleeding and death. Nausea, vomiting, stomach pain, irritation to mucous membranes, loss of appetite, and liver and kidney failure can result from repeated exposure. Studies on rats and mice given EDC po demonstrated the carcinogenic properties of EDC. Cancer of the stomach, spleen and other organs and subcutaneous cancer occurred in male rats and mice. Uterine cancer was detected in female mice and lung cancer in both male and female mice.

80-2675. Metelev, V. V. (All-Union Res. Inst. Exp. Vet. Med., Moscow, USSR) **Differentsial'naya diagnostika otravlenii ryb gerbitsidami. [Differential diagnosis of fish poisoning with herbicides.]** *Veterinariya (Moscow)* (4): 62-63; 1980 (Russian).

The methods of differential diagnosis of fish poisoning with herbicides propanide (propanil; 3,4-dichloranilide of propionic acid), benthiocarb [S-(4-chlorobenzyl) - *N,N*-dimethylcarbamate], and Yalan (molinate; S-ethyl-1-hexamethyleniminothiocarbamate) are described. Maximum permissible concentrations of propanide and Yalan in the rice are 0.3 and 0.1 mg/kg, respectively. Benthiocarb and Yalan have mildly cumulative properties, while propanide shows marked accumulation in fish. The major sites of accumulation are the liver and spleen for benthiocarb; liver, spleen, brain, and kidneys for propanide; and gill and skin for Yalan. All 3 herbicides are nervo-paralytic poisons. Diagnosis of fish poisoning can be made after detection of herbicide in corresponding tissues and organs and determination of lethal concentrations in water by gas chromatography.

80-2676. Hawkins, D. R.; Chasseaud, L. F.; Woodhouse, R. N.; Cresswell, D. G. (Dep. Metab. & Pharmacokinet., Huntingdon Res. Cent., Huntingdon PE18 6ES, England) **The distribution, excretion and biotransformation of *p*-dichloro (^{14}C) benzene in rats after repeated inhalation, oral and subcutaneous doses.** *Xenobiotica* 10(2): 81-95; 1980 (19 references).

Following repeated daily whole-body exposure (3 hr/day) of rats to atmospheres containing *p*-dichloro (^{14}C) benzene (1000 ppm), or administration of oral or sc doses (250 mg/kg/day), 24 hr tissue concentrations of ^{14}C were similar and did not increase after 6 days dosing, but tended to decrease. After repeated daily atmospheric exposures or oral doses, highest concentrations of ^{14}C occurred in fat, kidneys, liver and lungs. Concentrations declined rapidly to near or below limits of detection (< 0.2 ppm) in plasma and tissues at 5 days. After similar sc doses, tissue concentration declined more slowly. During 5 days after repeated dosing, most excreted ^{14}C (91-97%) was in the urine. Little was excreted in feces or expired air. Excretion was more prolonged following sc administration. After single doses to bile duct-cannulated animals, 46-63% of the excreted ^{14}C was in the bile during 24 hr. The pattern of metabolites in urine and bile was similar after each route of administration although there were quantitative differences. Urine extracts contained 2 major ^{14}C-components, namely a sulfate and a glucuronide of 2,5-dichlorophenol, representing 46-54% and 31-34% of the urinary ^{14}C respectively. Two minor components were identified by mass spectrometry as a dihydroxydichlorobenzene and a mercapturic acid of *p*-dichlorobenzene. The glucuronide of 2,5-dichlorophenol was the major ^{14}C component in bile (30-42%). (Author abstract by permission)

80-2677. Willems, A. G. M.; Overmars, H.; Scherpenisse, P.; DeLange, N.; Post, L. C. (Res. Lab., Philips-Duphar B. V., 1380 AA Weesp, The Netherlands) **Diflubenzuron: intestinal absorption and metabolism in the rat.** *Xenobiotica* 10(2): 103-112; 1980 (5 references).

The metabolic fate of the insecticide diflubenzuron was investigated in the rat with radioactively labeled forms of the compound. Intestinal absorption, measured as the sum of urinary and biliary excretion, diminished greatly with increasing dose, from about 50% at 4 mg/kg to about 4% at 900 mg/kg. Excretion was almost complete at 72 hr after dosing. At that time up to 4% of a dose was recovered from the carcasses of the rats. No detectable excretion of radioactive CO_2 occurred (< 0.5% of dose). The metabolic pattern in urine and bile was investigated with diflubenzuron labeled with both ^{3}H and ^{14}C. No unchanged compound was detected. About 80% of the metabolites appeared to have the basic diflubenzuron structure intact. Three of these, hydroxylated at either aromatic ring, were identified; they were largely excreted as conjugates in bile. The remainder, also largely excreted in the bile, constituted very polar materials. About 20% of the diflubenzuron underwent scission of the ureido bridge. One scission product, 2,6-diflurobenzoic acid, was largely excreted as such in the urine. Its counterpart, 4-chlorophenylurea, was not present in urine or bile in appreciable quantity; nor was 4-chloroaniline detected. (Author abstract by permission)

80-2678. Strother, A.; Wheeler, L. (Dep. Pharmacol., Sch. Med., Loma Linda Univ., Loma Linda, CA 92354) **Excretion and disposition of ^{14}C carbaryl in pregnant, non-pregnant and fetal tissues of the rat after acute administration.** *Xenobiotica* 10(2): 113-124; 1980 (20 references).

Non-pregnant or pregnant Sprague-Dawley rats on the 18th and 19th days of gestation were injected ip with a tracer dose (2.8 μCi/kg) of either [*ring*-^{14}C] carbaryl or [*carbonyl*-^{14}C] carbaryl. Distribution of total ^{14}C was examined in fetal, maternal and non-pregnant rat tissues. Pregnancy alters the disposition and excretion of carbaryl. Carbaryl crossed the placenta and was rapidly distributed in all fetal tissues. Highest concentrations were seen in fetal kidney. At 8 hr after injection fetal brain, heart and lung all contained more ^{14}C, on a wt basis, than their maternal organ counterparts. Elimination from the whole fetus was biphasic, and after 8 hr approximately 3% of the dose was still present in the whole fetus. Significantly more $^{14}CO_2$ was exhaled by the pregnant rat during 8 hr than by non-pregnant. Urinary excretion of ^{14}C after dosage with [*ring*-^{14}C] carbaryl was significantly less in pregnant than in non-pregnant rats. Kinetically, the tissue distribution of ^{14}C from carbaryl or metabolites was biphasic in pregnant and non-pregnant animals. [^{14}C]carbaryl concentrations declined rapidly for 1-2 hr. After 2 hr the ^{14}C levels from animals dosed with [*ring*-^{14}C] carbaryl declined more slowly. The pattern of ^{14}C distribution was more complicated after injection of [*carbonyl*-^{14}C] carbaryl. The ^{14}C activity increased in the animal tissues after 2 hr, in contrast to animals dosed with [*ring*-^{14}C] carbaryl. Non-pregnant animals treated with [*carbonyl*-^{14}C] carbaryl did not show a similar pattern of distribution. Carbamylated tissue proteins may, after time, release some bound *carbaryl*-^{14}C label, causing the increase in ^{14}C activity seen between 2 and 8 hr. However, this does not necessarily imply uptake of the intact carbamate. (Author abstract by permission)

80-2679. Baldwin, M. K.; Hutson, D. H. (Shell Res. Ltd., Shell Toxicol. Lab., Sittingbourne Res. Cent., Sittingbourne, Kent ME9 8AG, England) **The metabolism of 3-chloro-4-fluoro- aniline in dog and rat.** *Xenobiotica* 10(2): 135-144; 1980 (14 references).

3-Chloro-4-fluoro [^{14}C] aniline, orally administered to a female dog (0.135 mg/kg), was eliminated in the urine as 2-amino-4-chloro- 5-fluorophenyl sulfate (83% in 48 hr). When 3-chloro-4-fluoro [^{14}C] aniline was administered orally to male rat (*ca* 2.3 mg/kg), the 0-24 hr urine contained 2-amino-4-chloro- 5-fluoromethyl sulfate (52% of the aniline dosed), *N*-(5-chloro-4- fluoro-2-hydroxyphenyl) acetamide (13%) and an unidentified metabolite (16%). 2-Amino-4-chloro- 5-fluorophenyl

sulfate was identified after extraction as salts by protein and ^{19}F magnetic resonance spectrometry. *N*-(5-Chloro-4-fluoro-2-hydroxyphenyl)acetamide was identified by mass spectrometry and proton magnetic resonance spectroscopy. (Author abstract by permission)

80-2680. Crawford, M. J.; Hutson, D. H.; Stoydin, G. (Shell Res. Ltd., Shell Toxicol. Lab., Sittingbourne Res. Cent., Sittingbourne, Kent ME9 8AG, England) **The metabolic fate of a herbicidal methylmercapto-*s*-triazine (cyanatryn) in the rat.** *Xenobiotica* 10(3): 169-185; 1980 (21 references).

A major route of metabolism of the methylmercaptotriazine herbicide cyanatryne involves *S*-oxygenation. The *S*-oxide reacts spontaneously with glutathione affording a conjugate, which is eliminated in the bile, and a mercapturic acid which is eliminated in the urine. A small proportion of the administered dose was covalently bound to a component of the blood, probably hemoglobin. This was shown to be dependent on the formation of the *S*-oxide and on the species of animal studied. No reactivity of the *S*-oxide towards DNA *in vivo* or *in vitro* could be demonstrated. (Author abstract by permission)

80-2681. Crawford, M. J.; Hutson, D. H. (Shell Res. Ltd., Shell Toxicol. Lab., Sittingbourne Res. Cent., Sittingbourne, Kent ME9 8AG, England) ***S*-Oxygenation of an alkylmercaptotriazine herbicide by rat, rabbit and human liver enzymes.** *Xenobiotica* 10(3): 187-192; 1980 (11 references).

The oxidation of the herbicide cyanatryne to cyanatryne *S*-oxide and de-ethylcyanatryne was used to study *S*-oxidation and *N*-de-ethylation in liver microsomes from 3 species. Both reactions were dependent upon NADPH and were inhibited by metyrapone and CO. However, the enzyme catalyzing *N*-de-ethylation exhibited different species/sex specificity from the *S*-oxygenase. Rat liver flavoprotein *S*-oxygenation was catalyzed by cytochrome P-450. *S*-Oxygenation proceeded rapidly in human liver microsomes and the rate was linear from 60 min at 37°C. (Author abstract by permission)

80-2682. Wong, L. T.; Solomonraj, G. (Drug Toxicol. Div., Drug Res. Lab., Health Prot. Branch, Ottawa, Ontario K1A OL2, Canada) **Biliary and urinary excretion of ^{14}C warfarin in rabbits.** *Xenobiotica* 10(3): 201-210; 1980 (7 references).

The biliary and urinary excretion of racemic [^{14}C] warfarin (1 mg/kg) was studied in male rabbits. In the first 6 hr after dosing (iv), 6.2% of the administered radioactivity was excreted in the bile. The major biliary metabolites were identified as the glucuronide conjugates of warfarin and its hydroxylated metabolites. Four days after oral dosing, about 90% of the administered radioactivity was recovered in the urine. The major urinary metabolites were identified as warfarin alcohols, unchanged warfarin, 6-, 7-, and 4'-hydroxywarfarin; their structures were unequivocally confirmed by GLC-mass spectrometric analysis. In the rabbit, the bile was only a minor excretory route for warfarin, and only polar and bulky conjugates of the drug were eliminated by this pathway. (Author abstract by permission)

80-2683. Iwainsky, H.; Winsel, K. (Forschungsinst. Lungenkr. & Tuberk., DDR-1115 Berlin, DDR) **Veraenderungen biochemischer Prozesse der Lunge unter der Einwirkung von Schadstoffen. [Changes of biochemical processes of the lungs caused by air pollutants.]** *Z. Erkr. Atmungsorgane* 153(1): 142-149; 1979 (75 references) (German).

Recent literature concerned with the influence of air pollutants on biochemical processes of the lungs is reviewed. Among the pollutants considered is the pesticide paraquat, present as a dust in air. The activity of enzymes involved in the biochemical processes of the lungs as well as the kinetics of absorption and elimination are discussed.

See also 80-2401, 80-2403, 80-2404, 80-2405, 80-2408, 80-2413, 80-2415, 80-2416, 80-2419, 80-2421, 80-2422, 80-2423, 80-2425, 80-2426, 80-2427, 80-2428, 80-2429, 80-2430, 80-2431, 80-2433, 80-2438, 80-2439, 80-2441, 80-2444, 80-2447, 80-2448, 80-2450, 80-2451, 80-2452, 80-2460, 80-2465, 80-2471, 80-2475, 80-2481, 80-2486, 80-2496, 80-2498, 80-2499, 80-2503, 80-2508, 80-2511, 80-2512, 80-2515 *and* 80-2519.

80-2684. Toth, M.; Laszlo, E. (Dep. Agric. Chem. Technol., Tech. Univ. Budapest, H-1111 Budapest, Hungary) **High-sensitivity determination of cholinesterase-inhibiting insecticides in foods by automatic analysis.** *Acta Aliment. Acad. Sci. Hung.* 9(1): 74; 1980.

The high-sensitivity automated method which is described in this brief report permits the detection of organophosphate contaminants in 20 to 50 samples during a 1 hr period. The technique detects decreases in cholinesterase activity of human lyoplasma. Acetylthiocholine iodide is used as substrate and DTNB as the chromogenic agent in a procedure based on the principle of pre-inhibition. Phosphamidon, dichlorvos and DFP may be detected at ng/cm³ levels in water, milk, flour, bread, fruits and meat products. The method was efficient and results were reproducible.

80-2685. Takasashi, C.; Suzuki, T.; Hatakeyama, E.; Meguro, H. (Lab. Anal. Chem., Fac. Agric., Tohoku Univ., Sendai, Japan) **Determination of 3-cyclohexyl-5,6-trimethyleneuracil (Lenacil) by selection ion monitoring (SIM)-method using direct inlet system.** *Agric. Biol. Chem.* 44(3): 667-668; 1980 (6 references).

A method for the determination of lenacil in soil by selected ion monitoring (SIM), using the direct inlet system, is presented. Two methods for recovery of lenacil from soil are described. In method 1 soil samples were extracted with NaOH, centrifuged, and the supernatant was filtered. The residue was then re-extracted with NaOH, centrifuged, and refiltered. Filtrates were extracted with *n*-hexane. The aqueous layer was acidified and extracted twice with ethyl acetate. The solvent layer was washed and dried over anhydrous sulfate, filtered, concentrated under reduced pressure, and evaporated to dryness. The residue was then dissolved in acetone, a 10 μl aliquot was transferred to a sample tube, and the sample was evaporated to dryness. Method 2 involves extraction with ethyl acetate and HCl. The solvent layer was concentrated under reduced pressure and dried. The residue was then dissolved in acetone and prepared for mass spectroscopy in a manner similar to that of method 1. Recoveries ranged from 44.6 to 155.0% for method 1 and from 90.8 to 98.4% for method 2. Method 2 is recommended. An SIM chart was obtained at an ionizing voltage of 30 eV, ionizing current of 300 μA, and ion multiplier voltage of 1.15 kV. SIM was carried out with a JEOL-JMS-06 mass spectrometer. The detection limit of this method was found to be < 8 ppb. The possibility of sub-ppt level analysis is mentioned.

80-2686. Macy, T. D.; Loh, A. (Agric. Anal. Chem., Lilly Res. Lab., Div. Eli Lilly & Co., Greenfield, IN 46140) **Determination of oryzalin and prosulfalin residues in soil by high pressure liquid chromatography.** *Anal. Chem.* 52(8): 1381-1383; 1980 (8 references).

A method is presented for the analysis of oryzalin and prosulfalin in soil and crops which requires no derivatization of the 2 compounds before the HPLC step can take place. The 2 compounds are purified and separated by florisil column chromatography. Samples fortified with 0.02, 0.05, and 0.16 ppm oryzalin and prosulfalin averaged 92.5 and 88.6% recovery, respectively. Loam, clay loam and silt loam soils were used. It is suggested that HPLC can be used for routine assay of oryzalin and prosulfalin residues at 0.02 ppm in the soil. No interference was noted in tests using atrazine, benefin, chloramben, cyanazine, dinitramine, diuron, fluchloralin, isopropalin, linuron, metribuzin, nitralin, pendimethalin, profluralin, simazine or trifluralin.

80-2687. Janardan, K. G.; Schaeffer, D. J.*; Somani, S. M. (Illinois Environ. Prot. Agency, Springfield, IL 62706) **Efficiencies of liquid-liquid extraction, carbon, and XAD-2 absorption in isolating organic compounds from environmental sources.** *Bull. Environ. Contam. Toxicol.* 24(1): 145-151; 1980 (16 references).

Studies were performed to determine the efficiency of several techniques for extracting and isolating organic compounds from environmental sources. Liquid-liquid extraction, carbon and XAD-2 absorption were used on samples of industrial discharge. Samples were analyzed by gas chromatography/mass spectrometry. Fifty-five compounds were identified. A statistical program is presented by which the efficiencies of the procedures can be calculated. Liquid-liquid extraction had a 13% ± 5% efficiency, carbon had a 28% ± 11% efficiency, and XAD-2 absorption was 26% ± 8% efficient. It is suggested that factors such as differences between laboratories, compounds, data analysis techniques and matrix effects probably contribute to the observed differences between these data and some previously published works.

80-2688. Henry, F. T. (Miami Univ., Oxford, OH) **Gas chromatography and electrochemical studies of environmentally significant arsenicals.** *Diss. Abstr. Int. B* 40(12): 5636; 1980.

Monomethylarsonate (MMA) and dimethylarsinite (DMA) were determined at trace levels by differential pulse polarography (DPP). The arsenicals were isolated through interactions with ion exchange resins and digested in perchloric acid. Reduction by SO_2 allowed quantitation as As(III). Recoveries average 98% for MMA and 100% for DMA with relative standard deviations of less than 5% in each case. The detection limits were 18 ppb and 8 ppb, respectively. Inorganic As(III) was determined directly either in 1.0 *M* HCl or in 1.0 *M* $HClO_4$. Total inorganic arsenic (As_{tot}) was measured by DPP after the reduction of As(V) to As(III) with SO_2. The concentration of inorganic As(V) was evaluated as the difference between the results for As_{tot} and inorganic As(III). Speciation of the 4 forms of arsenic was possible in both reference and real samples. Also investigated were the formation and chromatographic behavior of the trimethylsilyl (TMS) derivatives of DMA,

MMA, As(V) and As(III). Evaluation of several silylation reagent and solvent systems revealed that the most suitable derivatization took place using *N, O-bis*-(trimethylsilyl) trifluoroacetamide. Gas chromatography mass spectrometry was used to confirm the identities of the derivatives. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 8013434)

80-2689. Sagredos, A. N.; Sinha-Roy, D. (Unilever Forschungsgessellschaft mbH, D-2000 Hamburg 50, BRD) **Method for rapid determination of polycyclic aromatic hydrocarbons in fats and oils via coffein complexes.** *Dtsch. Lebensm. Rundsch.* 75(11): 350-352; 1979 (17 references).

A reliable and comparatively convenient method for determining polycyclic aromatic hydrocarbons (PAH) in fats and oils is presented. The oil or fat is dissolved in cyclohexane and the PAH are isolated from this by complexing them in a coffein-formic acid solution. The complex is decomposed subsequently with an aqueous sodium chloride solution. The PAH are then extracted with cyclohexane and purified by silica gel columning. A thin layer chromatography separation on aluminum oxide-aluminum sheet follows and the individual PAH zones are scraped and evaluated via UV-spectroscopy and fluorescence measurement.

80-2690. Dive, D.; Devynck, J. M.; Leroy, G.; Fourmaux, M. N.; Moschetto, Y. (U146, INSERM, F-59650 Villenueve, France) **Identification of intracellular particles in ciliate protoza by Raman microprobe.** *Experientia* 36(7): 832-834; 1980 (6 references).

A Raman microprobe technique was used for the identification of intracellular particles of a pesticide added to a culture of the ciliate protozoan *Colpidium campylum*. Two methods, a wet and a dry, can be used for sample preparation. In both cases it was possible to find characteristic lines of 2 pollutants: 4′,4′-dichlorodiphenyl and β-endosulfan. Some technical problems were encountered. The dry method causes drastic cellular alteration. The cell can move and go out of laser focus in the wet method. (Author abstract by permission)

80-2691. Pluthero, F. G.; Threlkeld, S. F. H. (Dep. Biol., McMaster Univ., Hamilton, Ontario L8S 4K1, Canada) **Vacuum injection measurements of susceptibility to insecticides.** *J. Econ. Entomol.* 73(3): 424-426; 1980 (4 references).

The sensitivities of 5 strains of *Drosophila melanogaster* Meigen, raised from single wild-caught females, to malathion were assayed by using a vacuum-injection technique. This method had certain advantages over others currently in use, particularly in cases where mass topical applications and screenings are necessary and where certain kinds of behavioral studies are involved. (Author abstract by permission)

80-2692. Jain, R.; Agarwal, D. D.; Goyal, R. N. (Dep. Chem., Univ. Roorkee, Roorkee, India) **Rapid TLC separation of some closely related potential antineoplastic arylazothiazoles.** *J. Liquid Chromatogr.* 3(4): 557-560; 1980 (9 references).

A rapid thin layer chromatographic procedure is presented which uses a neutral solvent system for the separation of 25 closely related arylazothiazoles (including some fungicides and insecticides) on silica gel adsorbent. The composition of the developers used for some of the compounds was benzene:chloroform (50:50) and benzene:-chloroform:dioxane (50:40:10). For other compounds the developers were benzene:methanol (80:20) and benzene:-methanol:dioxane (75:20:5). It is noted that no tailing was observed for any of the compounds studied in the two series.

80-2693. Chian, E. S. K.; Meng, H.; DeWalle, F. B.; Norman, D. (Georgia Inst. Technol., Atlanta, GA) **Organics.** *J. Water Pollut. Control Fed.* 52(6): 1120-1143; 1980 (210 references).

A review of analysis methods for various organic compounds in water samples is presented. The compounds considered are detergents and related compounds; aliphatic and aromatic hydrocarbons; pesticides, chlorinated hydrocarbons and related compounds; naturally occurring organics; and organics present in surface and groundwater, drinking water and wastewater. Sample type, compound, methods, and significant results are presented in tabular form. In addition to methods of identification, for many compounds information on presence, degradation and attenuation is also presented.

80-2694. Olejnik, D.; Walkowsaka, A. (Dep. Hum. Nutr., Poznan Agric. Univ., Poznan, Poland) **Densitometric determination of chlorinated organic pesticides.** *Rocz. Akad. Roln. Poznaniu* 107: 61-68; 1979 (6 references).

A quantitative determination method for organochlorine pesticides is presented. Objectification of chromatogram readings was attempted by use of reflection spectroscopy measurements. Mixtures of pesticides were added to gel chromatography plates, and after development by the ascending technique, spots were detected by quartz lamp irradiation. Reflection spectroscopy of the samples and standards allowed quantification of the pesticides. Mean recoveries obtained were 82.3% *p,p′*-DDT, 87.7% *p,p′*-DDD, 78.5% *p,p′*-DDE, and 98.2% γ-HCH (γ-BHC, lindane). The methods described

can be used for determination of pesticides in a wide range of food products of varied water and fat content.

80-2695. Sugawara, N.; Ikeda, H.; Yoshino, J. (Sch. Legal Med., Fac. Med., Yamaguchi Univ., Yamaguchi, Japan) **[A study on identification and determination of paraquat dichloride.]** *Yamaguchi Igaku (Yamaguchi Med.)* 28(2): 199-205; 1979 (11 references) (Japanese).

Ion-exchange resin column chromatography, UV absorption spectrometry, colorimetry, thin layer chromatography and gas chromatography methods of analysis were investigated for the most suitable separation, purification, identification and determination procedures of paraquat. Paraquat was eluted in fractions 40-55 from Dowex 50 W-4 resin columns then washed stepwise with 1, 2, 3, 4, 5, 6 and 7 *N* HCl. Absorption maxima of paraquat were observed at 258 nm in water and at 260 nm in 5 *N* HCl. Reduction of paraquat with sodium hydrosulfite yielded a blue colored free radical. Calibration curves at 604 and 625 nm were linear for 5-50 μg/ml with this colorimetry method. Doragendoff's reagent and methanol: 6 *N* HCl (20:30, v/v%) were the most suitable thin layer chromatographic developing reagent and solvent system, respectively. Very small amounts (1 μg) of paraquat could be detected with this system. Reduction of paraquat with sodium borohydride was performed before determination of paraquat by the chromatographic method described.

80-2696. Sugawara, N.; Furuno, J. (Sch. Legal Med., Fac. Med., Yamaguchi Univ., Yamaguchi, Japan) **[Studies on identification and determination of paraquat dichloride (continued report).]** *Yamaguchi Igaku (Yamaguchi Med.)* 29(1): 13-17; 1980 (5 references) (Japanese).

A quantitative analytical determination method for paraquat was studied. The effects of sodium hydrosulfite ($Na_2S_2O_4$) and sodium hydroxide (NaOH) concentrations in the reducing agent on color development, and separation and purification by the positive ion-exchange resin Dowex 50 W-4, were examined. Bests results for reduction of paraquat by $Na_2S_2O_4$ in alkaline solution for colorimetry of paraquat were obtained with 1 ml of an aqueous 2% solution of $Na_2S_2O_4$ containing 1.5 *N* NaOH added to 4 ml of paraquat solution containing 3-20 μg paraquat. The batch method of adsorption and separation of paraquat dichloride for determination using Dowex 50 W-4 (200 - 400 mesh), after adsorption of 1000 μg of paraquat onto the resin and repeated elution with 3 ml of 7 *N* HCl 3 times resulted in an average paraquat recovery of 953 μg (3 test runs). After elution with 7 *N* HCl 5 times, recovery was 947 μg (3 test runs). The rates of recovery were 95.3 and 94.7%, respectively.

80-2697. Thielemann, H. (Hyg. Inst., Martin Luther Univ., DDR-402 Halle, DDR) **Quantitative duennschicht-chromatographische Bestimmung von Toxaphen im Bienenhonig ein Beitrag zur Rueckstandsanalytik. [Toxaphene residue analysis in honey by TLC.]** *Z. Gesamte Hyg. Ihre Grenzegeb.* 25(7): 556-557; 1979 (1 reference) (German).

A semiquantitative TLC method for determining toxaphene residues in honey using an extinction indicator equipped with the ERI 65 m integrator (Carl Zeiss Col, Jena) for evaluating the chromatogram is described. The method is based on determination of the ratio of color intensity and the intensity of light reflected from the illuminated FND commercial foil. Following chromatography and toxaphene detection under UV light the foil is used directly for quantitative measurement. In developing toxaphene spots the distance between the irradiation source and the foil must not be less than 70 cm or the entire foil will turn brown. The extinction indicator is a recording photometer measuring the relative degree of integrated extinction in mm as a function of μg toxaphene.

80-2698. Puchwein, G.; Schmidinger, G.; Hain, S.; Kruetzen, D. (Landwirtsch. Chem. Bundesversuchsanstalt Linz, A-4025 Linz, Austria) **Bestimmung von Chlorcholinchlorid Rueckstanden in Getriede nach duennschicht chromatographischer isolierung durch Remission-spektralphotometrie. [Determination of the chlorocholine chloride residues in cereals by remission spectrophotometry after thin layer chromatographic isolation.]** *Z. Lebensm. Unters. Forsch.* 169(5): 339-342; 1979 (9 references) (German).

A rapid and sensitive determination method for chlorocholine chloride (chlormequat chloride) residues in cereals is presented. Pesticide levels were determined by remission spectrophotometry of the dipicrylamine complex after thin layer chromatographic isolation of the residues. A sensitivity of 0.01 ppm was achieved on wheat and oats.

80-2699. Petz, M.; Thier, H. P.; Vogt, H. (Inst. Lebensmittelchem., Univ. Muenster, D-4400 Muenster, BRD) **Rueckstaende des Coccidiostatikums Amprolium in Fleisch und Eiern. Gas chromatographische Analysenmethode und Ergebnisse von Rueckstaendsuntersuchungen. [Residues of the coccidiostat amprolium in meat and eggs. Gas chromatographic method for the determination and results of residue analysis.]** *Z. Lebensm. Unters. Forsch.* 170(5): 329-333; 1980 (9 references) (German).

A rapid gas chromatographic method for coccidiostat amprolium residue analysis in muscle, organs, and eggs is presented. The method calls for the cleavage of the quaternary compound by an excess of sulfite. This yields 2-methylpyridine. The 2-methyl pyridine is detected by gas chromatography using the nitrogen-selective thermionic detector. Eggs and poultry meat spiked with amprolium at levels of 0.01 to 1.0 mg/kg were analyzed. The compound was recovered quantitatively with a high

reproducibility of results. Residues detected in eggs and meat of hens fed amprolium and locally purchased products are also given.

80-2700. Pflugmacher, J.; Ebing, W. (Inst. Pflanzenschutmittelforsch., Biol. Bundesanst. Land & Forstwirtsch. Berlin, D-1000 Berlin 33, BRD) **Eine neue Schnellmethode zur Bestimmung von Alkylen-bis-dithiocarbamate Fungicid Rueckstaenden. [A new rapid method for determination of alkylene-bis-dithiocarbamate fungicide residues.]** *Z. Lebensm. Unters. Forsch.* 170(5): 349-354; 1980 (19 references) (German).

A method for direct determination of alkylene-*bis*-dithiocarbamate fungicide residues which avoids the pitfalls of the commonly used carbon disulfide liberation method is presented. The new method is qualified to be used as a reference method. The indirect tolerance values for dithiocarbamates, which are expressed as the decomposition product carbon disulfide, is replaced by the residue data of the parent fungicides. Tests were performed with 5 fungicides placed on the surfaces of 7 plant crops. Results are compared for the determination of maneb and zineb on tomatoes and on lettuce in field experiments using both the new and the more common methods of analysis.

See also 80-2401, 80-2456, 80-2462, 80-2481 *and* 80-2494.

PESTICIDES ABSTRACTS

QUARTERLY INDEX

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PREFACE

The basic design for this index was supplied by the Chemical Information Division, Office of Pesticides and Toxic Substances, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc.).

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